THE LEATHER INDUSTRY: A STUDY OF THE IMPACT OF POLLUTION CONTROL COSTS

CONTRACT #E2C-211
THE PRESIDENT'S COUNCIL ON ENVIRONMENTAL QUALITY, 722 JACKSON PLACE, WASHINGTON, D.C.

PB 207 153

VOLUME II
Description of The Industry

Reproduced by
NATIONAL TECHNICAL
INFORMATION SERVICE
Springfield, Va. 22151

Urban Systems Research & Engineering, Inc.
1033 Massachusetts Ave., Cambridge, Mass. 02138 (617) 491-6820

153

CONTRACT NUMBER: EQC-211

THE LEATHER INDUSTRY: A STUDY OF THE IMPACT OF POLLUTION CONTROL COSTS

VOLUME 2: DESCRIPTION OF THE INDUSTRY

SUBMITTED BY:

URBAN SYSTEMS RESEARCH & ENGINEERING, INC.
1033 MASSACHUSETTS AVENUE
CAMBRIDGE, MASSACHUSETTS 02139

DECEMBER 1971

PREPARED FOR:

THE COUNCIL ON ENVIRONMENTAL QUALITY
722 JACKSON PLACE, N.W.
WASHINGTON, D.C. 20006

I

Reproduced by
NATIONAL TECHNICAL
INFORMATION SERVICE
U S Department of Commerce
Springfield VA 22151

Urban Systems Research & Engineering, Inc.
1033 Massachusetts Ave., Cambridge, Mass. 02138 (617) 491-6820

December 1, 1971

Mr. Eric Zausner
Council on Environmental Quality
722 Jackson Place, N.W.
Washington, D.C. 20006

Dear Mr. Zausner:

Attached is Urban Systems' final report on our Study of the Impact of Pollution Control Costs on the Tanning Industry.

The report is divided into three volumes entitled: The Executive Summary, The Industry Description, and The Impact of Pollution Control Costs on the Tanning Industry.

We were very pleased to be able to undertake this study and hope that it will contribute to an understanding of the impact of waste control on the tanning industry and the implications of pollution control policies and regulations for the industry.

Best regards,

Richard Williams

Richard Williams

RW:jak

IV

Acknowledgements

This report reflects the efforts of many individuals and the cooperation of an even larger number of tanners, shoe manufacturers, bankers, and others.

I want to particularly thank Peter Reuter and Charles Zigonis for bringing together much of the data and contributing large portions of the final report.

The most tedious data collecting, particularly the industry listing, was completed by a team at Lowell Technology Research Foundation, coordinated by William Plouffe. Carol McDonough was of particular assistance. Special acknowledgement must go to Mel Battles and Tom Thorstensen for their special insight into the tanning industry.

Unfortunately the individual tanners who were most helpful must go nameless because of the confidentiality of the information they provided. Dr. Culver of Camp, Dresser, and McKee was specially helpful in defining the technologies and costs of treating waste from tanneries.

I want to also thank Dr. Mel Fuss and Dr. Marc Roberts for reviewing the study and providing numerous helpful suggestions.

Of course a special thanks must go to Hoff Stauffer of the Environmental Protection Agency's staff for his guidance and encouragement. One sometimes gets the impression that government contract managers just spend their time waiting for reports to come in. Hoff Stauffer's long hours on the job made our long hours more bearable.

Richard Williams

Volume 2

TABLE OF CONTENTS

		Page
1.0	Description of the Leather Industry	1
	1.1 General Description	2
	Tables 1.1A through Table 1.1H	6
	1.2 Relationship of the Shoe Industry to the Leather Industry	16
	Table 1.2a	20
	Table 1.2A	21
	1.3 Trends in the Leather Industry	24
	1.4 Financial Condition of the Leather Industry	30
	Table 1.4A through 1.4G	32
2.0	Technology in the Leather Industry	45
	2.1 Technology in the Tanning Process	46
	Tables 2.1A through 2.1E	47
	2.2 Beam House Operations	61
	2.3 Chromium Waste	62
	2.4 Classification of Tannery Technology	63
3.0	Cost of Treating Tannery Wastes	66
	3.1 Introduction	67
	3.2 Municipal Charges to Tanneries	70
	3.3 Cost of Joint Town-Tannery Treatment Facilities	82
	3.4 The Cost of Treatment for Rural Tanneries	86
	3.5 Air Pollution and Solid Waste Disposal	88
	3.6 Cost of Clean Water Data	89
4.0	Shoe and Hide Industry Description	95
	4.1 Description of the Shoe Industry	96
	4.2 The Hide Industry	107
	DATA APPENDIX	115

1.0 Description of Leather Industry

1.0 Description of Leather Industry

1.1 General Description

Leather tanning is one of the oldest industries in the United States. It is still characterized by a large number of small producers. Over half of the tanning firms in the United States today employ less than twenty people. There are about 200 plants with over twenty employees.

Tanning firms were established where there was a supply of hides. This began in New England and the Mid Atlantic states and followed the cattle herds west, though with a long time delay. Today the industry is still in New England and New York, but it is also in Chicago near the old stockyards and in the dairy country of Wisconsin.

Eighty per cent of the value and 75 per cent of the square footage of leather industry shipments go to the American shoe industry. Though there are important sheepskin tanneries, the dominant type of tanning is cattle hide tanning. In 1970, the value of shipments was $86.0 million, with approximately

$320 million of value added. The total industry employed about 28,000 in 1970 which is a decline of 4,000 from 1968.

Of the leather which goes into shoes, 80 per cent by weight is used for upper shoe leather and the remaining twenty per cent is used for sole leather. Upper shoe leather is tanned almost exclusively by chromic sulfates and alkaline salts. On the other hand, sole leather is tanned by vegetable compounds. Sole leather wastes are highly pollutional due to the use of colors and dyes. Cheaper substitutes for sole leather have reduced the per cent of domestic soles made of leather to 16 per cent and the reduction is likely to continue.

For the most part, the tanning industry is still privately owned. This probably results from an absence of significant economies of scale and the low capital investment requirements in recent years. The tanning industry has seen very little technical development in recent decades though new labor saving technologies have been developed in Europe. The Bureau of the Census estimated that the industry's plant and

equipment have a replacement cost of $200 million. Prior to 1965, $6 million was typical for yearly investment in new plant and equipment for the entire industry. Since 1965, investment has been around $16 million annually.

Tanning firms are generally not integrated with their suppliers or customers. One firm is owned by a shoe company and several are owned by meat packing corporations. One of the largest tanning companies, A. C. Lawrence, is owned by Swift and Company, but Lawrence does not get Swift hides at reduced prices.

Hides make up about 30 percent of the cost of leather. Hide prices are determined by the total world supply of and demand for hides which varies substantially from year to year. Approximately thirty percent of American hide production is exported, requiring leather tanners to purchase the hides at price levels set by the world market. To a large extent the price of American hides to American tanners is set by the number of cattle slaughtered in Argentina, none of which come to the United States.

The ability of American hide producers to sell their hides abroad directly affects the cost of hides to the leather industry and hence the selling price of leather. Hide prices change drastically over time both up and down and leather prices follow almost perfectly. Yet the level of leather production is almost completely unaffected by the price changes.

Many of the hides which are exported from the United States come back as shoes, competing with domestically produced shoes. The ability of foreign produced shoes to penetrate the American market directly affects the amount of American leather which can be sold to American shoe manufacturers. Shoe imports have, for the first time, resulted in significant reductions in leather production.

	New Plant and Equipment Expenditures (million $)	Wage Payments (Million $)	Value Added (Million $)	Cost of Materials (Million $)	Inventories (Million $)	Employment (1000)
1958	7.9	165.5	275.8	464.9	149.3	37.1
1959	7.6	173.6	337.5	558.9	160.1	37.1
1960	6.1	163.9	278.5	508.5	149.3	34.5
1961	4.7	157.9	267.5	486.7	154.1	33.2
1962	7.2	157.2	263.6	491.0	146.8	31.7
1963	6.5	163.3	273.1	480.5	140.3	31.4
1964	7.8	169.0	300.2	481.3	137.7	31.2
1965	11.3	180.0	327.0	535.6	144.2	32.0
1966	17.3	189.2	326.4	614.1	144.4	32.7
1967	16.7	186.4	319.4	547.0	135.8	30.7
1968	16.6	196.0	349.5	524.5	137.0	31.1
1969	15.7	188.5	317.2	534.6	135.7	29.0
1970	NA		NA			28.0

TIME SERIES ON TANNING INDUSTRY

TABLE 1.1A

SIC: 3111 General Statistics of Leather Tanning & Finishing Industry

Year	Ratio of Value Added to Shipments	Ratio of Inventories to Shipments	Ratio of Payroll to value Added	Value of Shipments per Prod. Worker ($000)	Wage per Production Worker Man Hour ($)	Value Added per Prod. Worker Man Hour ($)	Number of all Employees (000)
1960	.352	.189	.589	26.4	2.238	4.84	34.5
1961	.351	.202	.590	26.5	2.255	4.86	33.2
1962	.344	.192	.596	28.1	2.310	4.95	31.7
1963	.360	.185	.598	27.8	2.377	5.00	31.4
1964	.383	.176	.563	28.9	2.408	5.50	31.2
1965	.382	.168	.550	30.7	2.443	5.75	32.0
1966	.347	.154	.580	33.4	2.511	5.68	32.7
1967	.367	.156	.584	32.9	2.699	6.05	30.7
1968	.401	.155	.560	32.6	2.853	6.61	31.7

Year	Number of Establish-ments	Book Value of Assets Employee (1964)	Special-ization Ratio	Coverage Ratio	Concentra-tion Ratio (1966)
1967	520	$6,121-	98%	99%	4 large-19% 8 large-30%

Table 1.1B

Time Series on Tanning Industry

	Domestic Shoe Production (millions of pairs)	Total Leather Production (million equivalent hides)	Cattle Hide Leather Production (millions equivalent hides)	Sole Leather Production (millions of pounds)	Shoe Side Upper Leather Production (millions of hides)	Belting Leather 1000's of Butts	Cattle Patent Leather 10000's of hides	Bag, Case, & Strap Leather 1,000's of hides	Upholstery Leather 1,000's hides	Misc. Leather 1,000's hides
1955	585		25.8	111.1	15.6	738	1,064	927	909	1,371
1960	600	31.7	22.0	82.4	14.4	517	796	838	365	810
1961	593	32.2	22.7	79.5	15.5	438	804	883	357	731
1962	633	31.6	22.5	69.7	15.2	506	968	867	419	734
1963	609	31.3	21.7	60.2	14.6	440	1,021	733	450	742
1964	613	32.2	22.8	64.2	15.4	463	938	736	486	790
1965	626	32.7	23.4	67.6	16.0	449	783	780	526	900
1966	642	32.3	23.8	68.7	16.3	412	690	685	522	950
1967	600	30.9	23.4	63.6	15.8	346	949	639	510	962
1968	642	31.9	24.0	59.6	16.3	367	1,075	615	634	1,096
1969	577	28.4	22.0	49.4	15.3	357	698	555	711	1,198
1970	559	25.9	20.4	40.4	14.3	306	883	480	560	1,247

Table 1.1C

Cattle Hide Leather Production

Table 1.1D

Non-Cattle Leather Production

Year	All Calf and Whole Kip Leathers (Millions of Skins)	All Goat and Kid Skin and Leather (Millions of Skins)	All Cabretta Leathers (Millions of Skins)	All Sheep and Lamb Leathers (Millions of Skins)	Horsehide Leather (Thousands of Pieces)
1955	10.4	26.1	2.73	24.0	544
1960	6.33	18.8	2.55	28.3	439
1961	6.39	14.9	2.26	29.6	483
1962	5.98	14.2	1.87	27.7	525
1963	5.60	14.2	2.54	21.3	421
1964	6.54	12.9	2.72	28.9	386
1965	6.26	14.6	2.89	27.8	359
1966	4.72	13.4	2.52	26.9	256
1967	4.01	8.46	2.60	26.2	241
1968	4.25	6.76	2.70	29.3	n.a.
1969	3.38	5.86	1.89	23.3	n.a.
1970	2.71	3.98	1.41	21.9	n.a.

Table 1.1E

Number of Tanneries and Value of Shipments by Size of Firms

	Total Number of Firms	Firms Employing 1-19	20-100	100-500	500-1000	1000+
1967	519	261	171	82	4	1
1970	496	257	162	73	4	
Value of Shipments (1967) $ million	-	101	260	440	107	NA

Table 1.1F
Consumption of Leather by Industry

Consumption by Industry	1958	1963 $ million	1967 $ million
Exports		41	42
Fabric Dress & Work Gloves	N/A	6.5	10.0
Leather & Sheep-Lined Clothing	19.9	17.5	20.2
Apparel Belts	12.0	12.8	18.4
Ind. Leather Belting		6	4
Footwear Cut Stock		46	39
Shoes, except rubber		457	504
House slippers		14	12
Leather Gloves & Mittens	148	22	23
Luggage	6.9	3	6
Handbags & purses	25.6	17	25
Personal Leather Goods	N/A	16	20
Leather Goods, n.e.c.	8.4	10	13
Games & Toys	N/A	.6	.9
Children's Vehicles, except bikes	N/A	1.6	2.4
Sporting Goods, n.e.c.	N/A	14.3	11.9
		685.3	751.8
Uses for which data could not be found:		(92.7)	(162.2)
Upholstery			
Handicrafts			
Jewelry			
Gaskets			
textile Machinery			

Table 1.1G

CENSUS DATA

Consumption - Quantity & Delivered Cost - Users of Leather & Other Materials

SHOE INDUSTRY	1958 Quantity	1958 Value $M	1963 Quantity	1963 Value $M	1967 Quantity	1967 Value $M
3141 Shoes, Except Rubber						
Finished Leather						
Upper Leather (M ft.^{2})	900.3	376.9	945.8	398.4	855.2	426.3
Soling (M lbs)	120	58.1	127.8	52.4	n/a	66.3
All other finished leather	n/a	6.2	n/a	5.9	n/a	10.9
Plastics - cloth backing (M yds.^{2})	10.2	11.6	13.2	15.6	13.1	18.6
Unsup. Plastics incl. porom. (M yds^2)	n/a	n/a	n/a	2.1	6.0	13.0
3131 Footwear Cut Stock						
Finished Leather						
Upper Leather (Mft^2)	n/a	4.9	9.5	3.2	8.2	4.6
Soling Leather (M lbs)	132.2	53.2	81.0	36.2	58.4	29.9
All other finished Leather (M lbs)	n/a	6.3	13.9	6.9	7.2	4.1
3142 House Slippers						
Finished Leather						
Upper (M ft^2)	32.7	11.9	24.9	9.6	22.2	9.5
Soling (M lbs)	n/a	2.0	4.2	2.9	n/a	1.4
All other finished leather	n/a	.3	n/a	1.4	n/a	1.1

Table 1.1G (cont.)

	1958		1963		1967	
	Quantity	Value $M	Quantity	Value $M	Quantity	Value $M
3151 Leather Gloves & Mittens						
Finished leather (M ft^2)	56.2	14.8	76.9	22.2	73.2	22.7
Broadwoven fabrics (M yds^2)	N/A	2.6	2.9	1.8	N/A	1.3
Knitted fabrics (M yds^2)	N/A	4.1	N/A	1.2	N/A	1.2
3161 Luggage						
Broadwoven Fabrics (M yds^2)	13.7	5.5	N/A	6.0	N/A	12.3
Plastics, cloth backing (M yds^2)	13.4	11.1	N/A	11.7	N/A	19.8
Plastic, not backed (M yds^2)	7.1	4.2	N/A	7.0	N/A	7.2
Finished leather (M ft^2)	20.6	6.9	N/A	3.2	N/A	5.5
3171 Women's Handbags and Purses						
Broad, fabrics (M yds)	12.9	9.0	10.5	7.9	N/A	N/A
Plastics, cloth backing M yds	12.6	9.9	22.6	24.7	15.6	20.3
Plastic, not backed M yds^2	11.4	7.4	15.2	11.5	27.0	20.1
Finished leather M ft^2	53.4	25.0	40.0	16.9	44.1	24.3
2381 Fabric dress and work gloves						
Finished leather M ft^2)	N/A	N/A	29.8	6.5	45.4	10.0
2386 Leather and Sheep-lined Clothing						
Finished Leather M ft^2	66.3	19.9	46.3	17.5	43.6	20.2
2387 Apparel Belts						
Finished leather M ft^2	22.6	12.0	26.1	12.8	33.8	18.4

Table 1.1G (cont.)

	1958		1963		1967	
	Quantity	Value $M	Quantity	Value $M	Quantity	Value $M
3172 Personal Leather Goods						
Plastic, cloth backing M yds^2		N/A	N/A	5.0	5.2	4.5
Plastic, not backed M yd^2		N/A	4.9	2.5	4.3	2.6
Finished leather M ft^2		N/A	36.9	15.8	40.5	19.7
3199 Leather Goods N.E.C.						
Finished leather M ft^2	21.6	8.4	18.7	10.4	21.3	12.7
3121 Industrial Leather Belting						
Finished leather M lbs	9.7	12.0	5.2	5.9	3.2	4.0
3941 Games and Toys						
Finished leather M lbs	N/A	N/A	3.4	0.9	1.4	0.6
3943 Children's Vehicles except bikes						
Finished leather	N/A	N/A	N/A	1.6	N/A	2.4
3949 Sporting and Athletic Goods						
Finished leather M lbs	N/A	N/A	8.2	14.3	9.6	11.9

Reproduced from best available copy.

Table 1.1H

Imported Leather		1967 Qty (mill.)	1967 Val. ($ mill.)	1968 Qty (mill.)	1968 Val. ($ mill.)	1969 Qty (mill.)	1969 Val. ($ mill.)	1970 Qty (mill.)	1970 Val. ($ mill.)
Leather Board	lbs	8.4	1.7	7.8	1.7	5.4	1.2	5.7	1.3
Leather, Upper, Calf & Kip	ft2	17.8	13.5	29.2	24.1	29.9	26.6	22.6	17.3
Leather, Lining, Calf & Kip	ft2	9.0	2.9	14.1	4.3	15.2	4.6	14.6	4.2
Leather, Calf & Kip, NSPF	ft2	7.5	4.9	7.0	3.4	6.2	2.9	7.2	2.9
Leather, Upholstery	ft2	1.7	.7	2.6	1.1	2.6	1.3	2.5	1.3
Leather, Upper, Bovine, Not Fancy	ft2	16.9	4.6	22.4	5.3	24.1	6.4	28.8	8.2
Leather, Belting, Bovine, Not Fancy	ft2	.7	.7	.8	.7	1.1	1.0	1.4	1.2
Leather, Glove & Garment, Not Fancy	ft2	3.0	.8	2.7	.9	1.8	.7	7.2	1.9
Leather, Bovine, NSPF, Not Fancy	ft2	38.8	9.7	44.4	10.3	55.4	13.4	69.5	18.2
Leather, Fancy, NSPF	ft2	.8	.6	.7	.5	.8	.6	1.9	1.0
Leather of sheep & lamb skins, Not Fancy		NA	2.4	-	3.8	-	3.8	-	5.1
Leather, Coat, Veg-tanned, (rough)	lbs	1.7	2.9	2.7	3.8	2.9	5.0	2.5	3.9
Leather, Goat & Kid, Not Fancy	ft2	14.6	7.9	11.3	6.2	9.4	5.6	13.4	7.8
Leather, Goat & Kid, Fancy	ft2	2.6	2.4	3.7	1.9	4.5	2.6	4.6	2.7
Leather, Chamois, oil-tanned	DPC	.3	3.7	.3	3.7	.3	3.9	.3	3.3
Leather, Patent, Genuine	ft2	2.3	1.2	5.5	3.3	3.8	2.3	4.7	2.9
Leather, Pig & Hog		NA	1.2	-	-	-	-	-	-
Leather, Reptilian & Shark Skin, Not Fancy		NA	5.8	-	-	-	-	-	-
Leather, NSPF, Not Fancy, incl. parchment & chamois, except oil tanned		NA	2.0	-	-	-	-	-	-
Belting Leather, fin. or semi-fin., form or shape	lb	.2	.6	.2	.5	.2	.5	.1	.4
Harness, Saddles, Saddlery & parts		-	3.1	-	4.0	-	5.1	-	5.1
Leather, cut or shaped for conversion into footwear		-	1.9		2.3	-	2.8	-	2.7
Leather straps & strops		-	.9	-	1.2	-	1.2	-	1.5
Leather articles, NSPF, Book Bindings, covers, shoe laces, etc., made in part of leather			4.1	-	7.0	-	7.0	-	6.8
Leather, NSPF, Not Fancy, incl. linings, except oil-tanned		-	-	-	8.1	-	6.2	-	5.2
Leashes, collars, muzzles, harneses & other dog equip.		-	1.9	-	3.0	-	3.7		4.6

1.2 Relationship of the Shoe Industry to the Leather Industry

The ability of the tanning industry to absorb or to pass on increased production costs is critically affected by the industry's relationship with the shoe industry.

Leather producers are very price competitive with each other, and that competition is actively encouraged by the shoe firms. Leather salesmen go to the shoe companies with their leather styles. If the shoe company wants to use one tannery's type of leather, it is not unusual for them to ask other tanneries if they can make the same style. All of the tanneries are then asked to bid on supplying the particular style of leather. There is an additional negotiation phase. Purchasers for the shoe companies follow the cost elements of tanning, particularly hide prices, very carefully. It is common for people in the shoe companies to have worked for leather companies and vice versa. Therefore, the final price of leather

sold to the shoe industry is set by price competitive bidding and by final negotiations between persons very knowledgable of cost elements in both industries.

Shoe companies do not maintain sole source relationships with one or more tanneries. In the course of the year, a buyer for a large shoe firm may deal with 40 or 50 tanneries. Price is an important factor, but shoe companies do consider whether they believe the tannery can deliver the leather at the quality desired on time, and these impressionistic factors are influenced by previous experience with the tannery. But basically each leather purchase requires a new bidding and negotiation round.

An additional element in the tannery-shoe manufacturer relationship is that there are no regional advantages to leather producers. Shoe firms do not confine their leather purchases to tanneries in their geographical region except in the very broadest sense that there are some marginal advantages because of shipping costs.

It is crucial in understanding the effect of pollution control costs to understand the pricing of leather. Shoe sales are basically determined by population and personal disposable income. The sales are divided between imports and domestically produced shoes. Until the last three of four years when imports increased dramatically, total domestic shoe production was fairly predictable and constant with population. Yet even now the market for leather is basically a function of how many shoes will be made in the United States.

Once the shoe manufacturer decides how many shoes he wants to make, he then goes to the tannery and buys the necessary leather. The amount of leather is fixed by the shoe industries decision as to how many shoes they can sell.

After the tannery has a contract with the shoe manufacturer, the tannery buys the required number of hides. Most leather is not bought "off the shelf". Pricing works in the reverse direction though the shoe manufacturer and the tanners set their prices by estimating what they think their materials costs

will be. Hide prices are set by the world market and tanners buy hides at whatever price is required to get that fixed amount of leather to supply the shoe industry. The leather prices that the shoe firms pay are set by the hide prices but again the level of leather sales is unaffected. In the long run, leather usage by shoe manufacturers could be affected by leather prices because of competition from synthetics. But the cost savings to the shoe manufacturer are more in the cost of manufacturing the shoe than in the materials cost. Average leather prices have increased somewhat in the last decade, but they have been more characterized by large fluctuations. Figure 1.2a quotes hide prices, leather prices, and shoe prices, and Table 1.2A lists leather production along with leather prices.

The price of leather has moved, in response to large proportional changes in hide prices. The key point is that the output series for the leather industry has not moved to nearly the same degree. A price increase of 12 per cent in 1966 was accompanied by

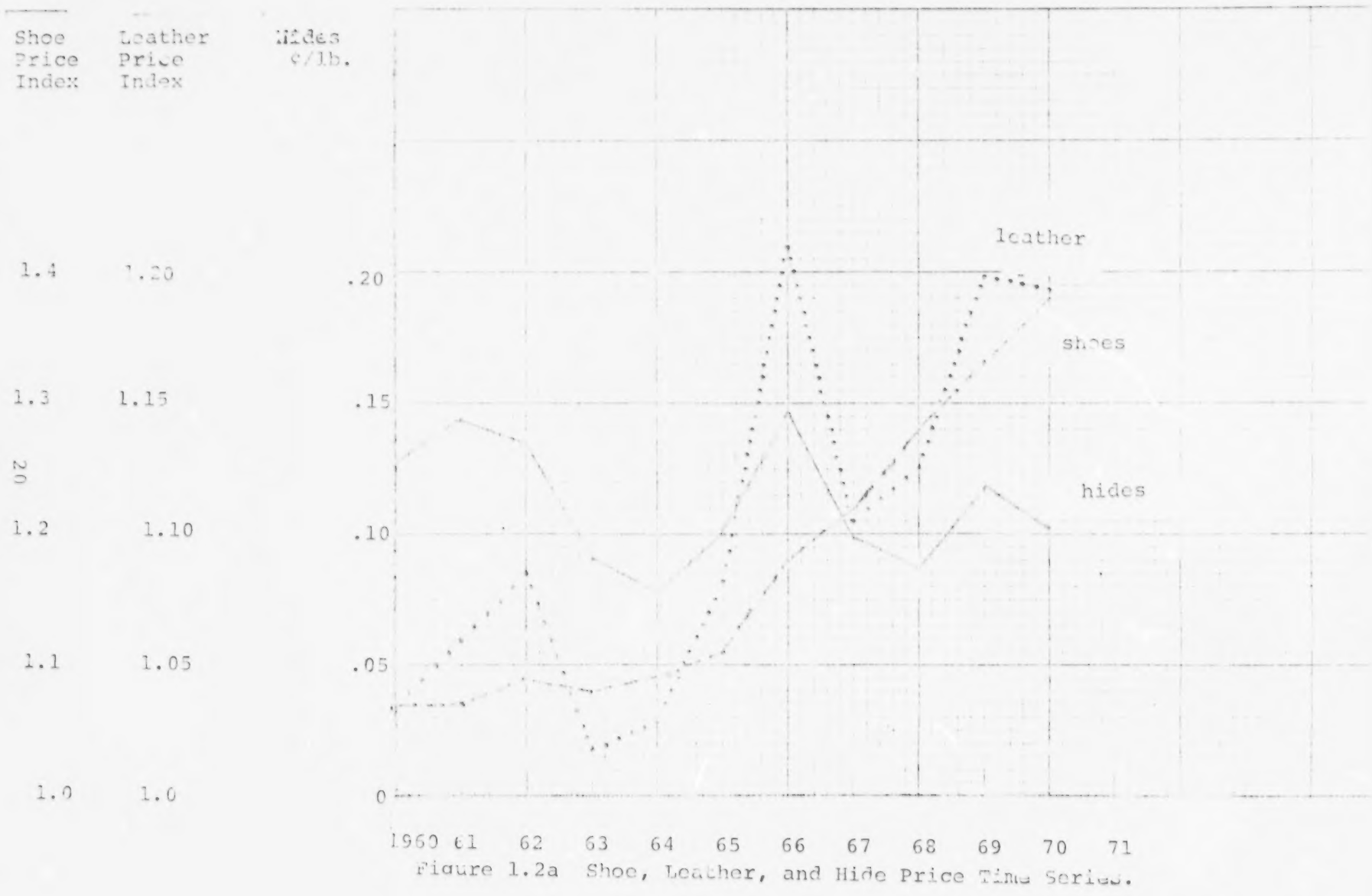


Figure 1.2a Shoe, Leather, and Hide Price Time Series.

	Domestic Cattle Hide Prices (cents per pound)	Domestic Leather Prices (Index: 1957-59= 100)	Domestic Leather Production (1000 equi-valent hides)	Domestic Shoes Prices (Index: 1957-59= 100)
1955	8.4	NA	NA	NA
1960	12.8	103.5	31,693	107
1961	14.3	106.0	32,226	107
1962	13.5	108.5	31,596	109
1963	9.0	101.9	31,325	108
1964	7.9	102.9	32,187	109
1965	10.0	108.1	32,697	111
1966	14.6	121.0	32,252	118
1967	9.9	110.5	30,861	122
1968	8.6	112.6	31,884	128
1969	11.8	119.9	28,388	133
1970	10.1	118.8 (Jan-Oct)	25,941	138 (Jan-June)
1971	8.5 (ave. Jan-March)	NA	NA	NA

Table 1.2A Shoe, Leather and Hide Price Time Series

a decline of only 1.5 per cent in leather shipments (in quantity). The price decline of 9 per cent in the following year coincided with a fall of 4 per cent in shipments. Even if the real relationship, for technical production reasons, is between leather price in 1966 and leather use in 1967, the relevant elasticity is only about .5. It is well to note that the domestic shoe price series rises rather steadily from 1965 to 1970, reflecting not at all the movement in leather prices.

We argue then that the price elasticity of demand for leather is low. Two reasons for this can be given. The first is that the final demand for shoes is price inelastic (as estimated by Houtthakker and Taylor, "Consumer Demand in the U.S.A. 1929-1967", Harvard University Press, 1970), and the price advantage of imported shoes is so great that small changes in domestic prices probably have little effect on the share of imports. Secondly, the substitution of synthetics for leather is a function primarily of expectations about the acceptability of synthetics and again is relatively insensitive to marginal leather price changes.

Leather production has thus been unaffected by large changes in the cost of production. Pollution control costs would appear as increased production costs and their affects should be very similar.

1.3 Trends in the Leather Industry

After declining throughout the 1950's, the size of the industry stabilized in the 1960's, only to continue its secular decline in 1969 and 1970. Employment fell from 37,000 to 32,000 between 1958 and 1961, then fluctuated between 30,000 and 32,000 until 1968. 1969 and 1970 both saw substantial declines, the 1970 employment figure being only 28,000. In current dollars, shipments rose from $791 million in 1960 to $860 million in 1969. In real terms, output rose by only 3 per cent in the same period.

The picture of stagnation is somewhat contradicted if we review wages and productivity figures. The average straight-time hourly wage in the tanning industry, for a work force consisting primarily of semi-skilled and unskilled workers, was $2.56 in 1968. Value added per production worker man hour was $6.61 in 1968, up from $4.40 in 1958. In real terms this amounted to approximately a 2.5 per cent productivity

increase per annum, close to the average for the manufacturing industry as a whole.

The number of firms has declined slightly over the last decade, again after falling steadily throughout the 1950's. The 1958 census recorded 578 establishments, of which 280 had more than 20 employees. In the 1963 census, figures were 525 and 256, in 1967 519 and 258. There seems little sign of increasing concentration. The mortality rates for the over-20 and under-20 employees group suggest that some large plants have closed but the usual trend is for weaker firms to decrease in size and smaller firms to close. There is a general impression that productivity and size are not well related except for the smallest and weakest firms, and that there are no important technological trends that are likely to affect this.

Two factors are very important in determining the future growth or decline of the tanning industry. The first is the extent to which synthetics will be substituted for leather in the production of shoes; the second, the extent to which foreign producers are able to maintain their price and style advantage in the shoe market.

The advantage to the shoe industry of using plastics rather than leather are discussed in detail in Section 4.1. Suffice it here to say that the main advantage is not price but the possibility of using more automated techniques of shoe production. Two reasons why this has not yet resulted in a total reliance on plastics seem to be most important. The first is a general technological conservatism in the industry, typical of any small firm industry. The second, which is perhaps more relevant here, is a widespread uncertainty about the extent to which the public will accept plastic rather than leather shoes. Certainly there is a common image that leather shoes are of superior quality.

The substitution against leather and the growth of imports are closely linked phenomena, an important fact for the tanning industry. The reaction of the domestic shoe industry to the penetration of imports has been to move into synthetics, so that foreign leather shoes are frequently competing now with domestic non-leather shoes. Given that the use of synthetics requires a higher technology process, it is quite probable that American producers have a comparative

advantage in the production of these shoes.

Restrictions on the import of shoes would be of double benefit to the American leather industry, not only increasing the number of domestically produced shoes but also probably slowing down the decline in the leather content per domestically produced shoe. Below is a table which shows the decline in the percentage of sole and uppers which are wholly, or partly, made from leather. The decline is both long term and substantial. In the case of soles, it has been rather steady since 1953. For uppers, on the other hand, the rate of substitution of synthetics has increased very substantially in the second half of the period. It would be reasonable to ascribe at least some of this increase to the entry of imports. Without import restrictions, we must project a continuation of this trend against the use of leather.

Tables 1.1C, 1.1D, 4.1D list leather production by type since 1960. Projecting production levels into the future is very difficult because of the uncertainty

as to domestic shoe production and leather usage per shoe. In the shoe section of this report there is a projection of shoe production made in 1968 for the American Footware Manufacturers Association. One would expect the projection to be pessimistic about U.S. production because the AFMA was using the projection as an argument for import restrictions. Yet since 1968, imports have been higher than projected and domestic production lower. There hardly seems to be any point in attempting to make another projection here. The only projection which can be made with a good confidence level is that without restrictions on imported shoes domestic shoe production will continue to decline and leather production will decline with it.

Again synthetic substitution is the other variable affecting future leather production levels, the important point being that there is serious pressure towards substitution. The manufacturers of shoe making machinery are devoting considerable effort

to develop equipment for making shoes out of synthetics. Yet consumer acceptability is still in doubt. Again it would seem that the specific future level of synthetic substitution is in doubt, but it will be an increasingly important phenomena.

The leather industry is now promoting the idea that leather products are the quality item in their field--shoes, luggage, etc.--and these will be the items people will want to buy when they can afford them. This strategy may preserve a place for leather products in the market but not at previous production levels.

1.4 Financial Condition of the Leather Industry

1.4.1 Introduction

Any analysis of the impact of pollution abatement regulations must rest on an appreciation of the financial position of the industry. Of particular concern are the level of profitability of the industry and its capacity to raise capital for the financing of new abatement equipment.

In economic theory the two should be perfectly related. If the industry can maintain a continued positive cash flow after installing waste treatment plants, then the industry should be able to borrow the required capital, with appropriate risk premiums. However, it is not the industry that borrows but individual firms in it and the lender's appraisal is of the firm and not of the industry. It is easy then to ignore the fact that the whole industry is undergoing a transformation and to assume that additional costs incurred by the borrowing firm will put it at a serious long term disadvantage. Conversations with bankers certainly lend credibility to this view; their concern is simply with the firm's financial position, not its

adjustments relative to the adjustments of the industry.

1.4.2 Data

Before discussing the available data and our analysis of them, we should point out the difficulty of obtaining accurate figures. Because all but three or four companies are closely held corporations, or subsidiaries of companies which are not principally tanneries, profit and loss statements are not filed with any public authorities. A small number of states require the filing of capital accounts, but these covered only a few firms and in any case give only partial information of sometimes dubious value. Dun and Bradstreet was used but could provide information on only a few firms; again the information was very selective and not very precise in many cases. An analysis of the financial statements of 35 tanneries which was made by Robert Morris Associates of Philadelphia provided the most reliable data, though individual firm data were not given. Aggregate census data is reported in the tables.

1.4.3 Current Financial Conditions

Most tanneries list very few long term assets

Table 1.4A

Time Series on Tanning Industry

	Value of Shipments $ millions				
	of Industry SIC 3111	of Leather Tanning & Finishing all Producers	Production 1,000 equiv Hides	Value of Exports $ million	Value of Imports $ million
1960	791	683	31,693	32	40
1961	761	650	32,226	46	39
1962	766	656	31,596	34	49
1963	758	735	31,325	41	44
1964	784	658	32,187	41	47
1965	857	726	32,697	39	55
1966	941	799	32,252	42	75
1967	870	846	30,861	42	68
1968	878	856	31,884	45	81
1969	860	831	28,388	42	86
1970	NA	NA	25,941	37	82

Expenditures for New Plant and New Equipment by Industry Group 19 & 19

millions of dollars

Code	Industry Group	1969			1968		
		Total new expenditures	New structures & additions to plant	New machinery & equipment	Total new expenditures	New structures & additions to plant	New machinery & equipment
111	Leather tanning & finishing	15.7	3.6	12.1	16.6	4.7	11.9
121	Industrial leather belting	0.7	0.1	0.6	0.5	0.1	0.4
131	Foot wear cut stock	4.5	1.2	3.3	2.1	0.4	1.7
151	Leather gloves & mittens	0.8	0.5	0.3	0.6	0.2	0.4
161	Luggage	5.6	2.1	3.5	8.5	4.2	4.3
171	Women's handbags & purses	3.1	0.6	2.5	3.5	1.1	2.4
172	Personal leather goods	1.3	0.2	1.1	1.3	0.2	1.1
199	Leather goods n.e.c.	1.0	0.3	0.7	1.1	0.3	0.8

Table 1.4B

Gross Book Value of Depreciable Assets & Value of Shipments,
Operating Manufacturing Establishments - 1968 & 1967

(in millions of dollars)

Code	Industry	Gross Book Value of Depreciable Assets, end of year			Value of Shipments	Gross Book Value of Depreciable Assets, end of year			Value of Shipments
		Total	Structures & Buildings	Machinery & Equipment		Total	Structures & Buildings	Machinery & Equipment	
3111	Leather Tanning & finishing	205.0	73.1	131.9	877.9	194.7	69.9	124.8	870.1
3121	Industrial leather belting	11.9	3.7	8.2	51.8	11.6	3.6	8.0	53.8
3131	Foot wear cut stock	NA	NA	NA	262.1	NA	NA	NA	262.8
3151	Leather gloves and mittens	6.9	2.9	4.0	83.5	6.8	2.8	4.0	86.7
3161	Luggage	60.6	22.9	37.7	357.6	62.9	23.8	39.1	334.2
3171	Women's handbags & purses	33.9	9.8	24.0	358.6	33.2	8.8	24.5	327.2
3172	Personal leather goods	29.6	11.5	18.1	191.6	29.5	11.3	18.2	186.2
3199	Leather goods n.e.c.	13.9	3.5	10.4	95.3	12.9	3.2	9.7	96.3

Table 1.4C

Rental Payments for Structures & Machinery & Equipment, operating Manufacturing Establishments: 1968 - 1967

(in millions of dollars)

SIC CODE	Industry Groups	Rental Payments					
		1968			1967		
		Total	Structures & Bldgs.	Machinery & Equipment	Total	Structures & Bldgs.	Machinery & Equipment
3111	Leather tanning & finishing	4.8	2.7	2.1	4.2	3.0	1.2
3121	Industrial Leather belting	0.2	0.1	0.1	0.2	0.1	0.1
3131	Footwear cut stock	2.7	2.4	0.3	2.2	1.9	0.3
3151	Leather gloves & mittens	0.2	0.2	N.A.	0.2	0.2	N.A.
3161	Luggage	4.5	3.7	0.8	5.7	4.6	1.1
317	Handbags & personal leather goods	7.0	6.0	0.9	6.2	5.6	0.6
3171	Women's handbags and purses	4.9	4.3	0.5	4.4	4.0	0.4
3172	Personal leather goods	2.1	1.7	0.4	1.8	1.6	0.2
3199	Leather goods n.e.c.	1.4	1.3	0.1	1.5	1.4	0.1

Table 1.4D

Table 1.4E

VALUE OF SHIPMENTS OF PRODUCT CLASSES: 1969, 1968, 1967

SIC code	Class of Products	VALUE OF SHIPMENTS Million Dollars		
		1969	1968	1967
3111-	Tanned and finished leather.	830.8	855.5	846.5
31111	Finished cattle hide and kip side leathers.	503.9	496.9	495.7
31112	Finished calf and whole kip leather.	33.0	35.6	35.6
31113	Finished sheep and lamb leather.	70.6	86.1	60.9
31114	Other finished leather.	73.2	68.5	75.3
31115	Rough, russet, and crust leather. (not finished in this establishment)	31.2	34.1	30.5
31110	Tanned and finished leather n.s.k.	27.2	28.2	35.1
31119	Contract & commission receipts for tanning and finishing leather owned by others.	91.7	106.1	113.1
31210	Industrial leather belting and packing.	45.8	43.0	44.7
31310	Boot and shoe cut stock and findings.	264.4	263.7	254.3

or liabilities. The great majority of their recorded assets are inventories and accounts receivable, while their debts are bank credit and accounts payable. In light of this, our discussion focuses heavily on the short term capital account of firms.

Current ratios i.e. the ratios of current assets to current liabilities, were distributed in roughly the same way as in other comparable small firm industries (e.g. footwear manufacture, pulp and paper manufacture) except that the lowest quartile of firms with sales less than $1,000,000 were in the worst position, with an average current ratio of one. Since the figures were drawn from 1970 accounts, after three years of decline, this probably represented a short-term, though important, increase in the vulnerability of a significant number of firms. Some feel for the sharpness of this recent decline can be gained by the fact that our telephone survey of some 80 firms which were in operation in 1969 employing 20 or more people, found some eight of them either out of business or at the point of closing down. This comes after eight years of an almost constant number of firms. As discussed

elsewhere in this report, we feel that the general trend for output in this industry is downward for the next few years and the number of firms in the industry is likely to continue to decline.

Our concern is with those firms that are not threatened by the general decline in the industry. For this group, which we take to be the upper 3/4 of the population, classified by their current ratio, the overall financial position seems reasonably healthy. They have inventories available as collateral for loans which are substantial relative to the firms' absolute size. For the industry, inventories were $136 million in 1967, compared to sales of $846 million. The Morris study reported average profits before taxes of 5.5 percent.

1.4.4 Capital Resources

Discussion with bankers and members of the industry indicated that the available balance sheets may conceal the long term assets of the firms. For tax purposes, a family owning a tannery may choose to set up a separate corporation which purchases plant and equipment from the tannery and then rents them back. This may explain

why the 1967 census estimates the replacement cost of tannery plant and equipment at $200 million, though our balance sheet data point to a much lower figure. This phenomenon is important because interviews with tanners have revealed a greater confidence in their ability and willingness to raise capital for pollution control equipment than one would expect on the basis of the tanneries financial statements alone.

The final point to consider before a discussion of the industry's capacity to finance waste treatment facilities is the implication of family ownership. Many tanneries have been owned by the same family for two or more generations, often in small towns. If the decision to be made is between closing down or making an investment for abatement facilities, the criterion used will not be the impact on the profit margin alone. Obviously there are important constraints on the extent to which profit rates can be ignored but these entrepreneurs are not to be taken as pure profit maximizers. The decision to cease production is a traumatic one for many owners of tanneries. When one adds to that the impression that the owners have assets outside of the

tannery which are often substantial in relation to the capital needed for abatement facilities, it becomes clear that we must do more than calculate rates of return on sales or aggregate assets.

1.4.5 Financing Abatement Equipment

Interviews with both industry and banks emphasized that most financing of new abatement equipment would come from the firms themselves. The banks have had very little loan business with tanneries in recent years, apart from the continuing financing of their inventories, and felt that they would be reluctant to provide large scale capital for treatment plants in a declining industry. The firms themselves mirrored these attitudes, though they did not give the impression that they had talked directly to the banks. On the other hand, after complaining about the severity of pollution regulations, they generally admitted that they could, and would, provide the necessary finance from their own sources.

Some interesting aggregate evidence is available on this. Plant and equipment expenditures, after fluctuating between $4.5 million and $8 million from 1958

to 1964, rose sharply in 1965 and 1966 and have since been close to $16 million. We have no breakdown of this series that would enable us to separate out abatement expenditures from other investment. Nevertheless, we believe that most of the increase represents expenditures for pollution treatment and pre-treatment facilities. Output has declined in the last three years, after stagnating in the early and mid 60's and expectations have been generally depressed. The level of investment in the period 1960-65 probably was close to the level of replacement investment required to maintain output capacity. Hence, we ascribe most of the post 1965 increase to investment in abatement equipment. All our evidence points to this being essentially self-financed.

Concerning profit rates in this industry, we have two figures. The first is that given by the American Management Association which cited a 1969 after tax profit rate of 3.4 percent on sales. The Morris survey of 35 companies gives a pre-tax profit rate of 5.5 percent on sales, which is consistent with the AMA figure. If we are right in estimating the added

Table 1.4G

MANUFACTURERS OF—TANNING, CURRYING & FINISHING

17 STATEMENTS
ENDED ON OR ABOUT JUNE 30, 1970
18 STATEMENTS
ENDED ON OR ABOUT DECEMBER 31, 1970

Reproduced from best available copy.

UNDER $250M	$250M & LESS THAN $1MM	$1MM & LESS THAN $10MM	$10MM & LESS THAN $25MM	ALL SIZES	ASSET SIZE
	15	16		35	NUMBER OF STATEMENTS
%	%	%	%	%	ASSETS
	9.0	4.3		4.8	Cash
	6.8	10.2		8.1	Marketable Securities
	24.0	21.2		21.6	Receivables Net
	24.7	30.8		32.0	Inventory Net
	1.0	2.5		1.9	All Other Current
	66.5	69.0		68.4	Total Current
	24.2	20.4		22.1	Fixed Assets Net
	9.3	10.7		9.5	All other Non-Current
	100.0	100.0		100.0	Total
					LIABILITIES
	9.0	10.0		8.8	Due To Banks—Short Term
	11.6	9.4		9.8	Due To Trade
	3.6	3.4		2.8	Income Taxes
	2.5	1.0		1.5	Current Maturities L.T. Debt
	8.8	8.2		7.5	All Other Current
	35.5	32.0		29.9	Total Current Debt
	6.8	6.2		7.9	Non-Current Debt Unsub.
	42.3	38.2		37.8	Total Unsubordinated Debt
	8	4.2		4.1	Subordinated Debt
	56.9	57.6		57.1	Tangible Net Worth
	100.0	100.0		100.0	Total
					INCOME DATA
	100.0	100.0		100.0	Net Sales
	80.9	84.2		83.1	Cost Of Sales
	19.1	15.8		16.9	Gross Profit
	15.1	9.2		11.5	All Other Expense Net
	4.0	6.6		5.4	Profit Before Taxes
					RATIOS
	1.9	1.5		1.6	
	1.1	1.1		1.1	Quick
	.6	.7		.7	
	2.8	2.4		2.6	
	1.7	2.0		2.0	Current
	1.0	1.7		1.2	
	.0	.2		.1	
	.4	.4		.4	Fixed/Worth
	.6	.5		.5	
	.3	.4		.4	
	.7	.7		.7	Debt/Worth
	3.5	1.0		1.4	
	.3	.4		.4	
	.7	.7		.7	Unsub. Debt/Capital Funds
	2.6	.9		1.2	
20 18.2	35 10.3		36 12.1		
36 10.0	42 8.5		49 8.7		Sales/Receivables
41 8.2	58 6.2		54 6.7		
31 11.8	39 9.3		38 9.6		
47 7.6	53 6.8		60 6.0		Cost Sales/Inventory
80 4.5	150 2.4		109 3.3		
	7.7	8.0		8.0	
	4.7	7.0		5.2	Sales/Working Capital
	76.0	2.4		2.3	
	7.8	4.4		5.2	
	4.0	2.6		3.3	EBIT/Assets
	2.5	1.7		2.1	
	38.5	31.2		21.9	
	17.4	17.1		17.1	% Profit Bef Taxes/Worth
	6.7	2.7		6.6	
	10.2	11.2		15.0	
	7.0	10.8		9.2	% Profit Bef Taxes/Tot Assets
	4.0	1.9		2.7	
	$238.2M	$925.1M		$1,160.2M	Net Sales
	90.6M	387.8M		512.8M	Total Assets

MANUFACTURERS OF—FOOTWEAR

19 STATEMENTS
ENDED ON OR ABOUT JUNE 30, 1970
62 STATEMENTS
ENDED ON OR ABOUT DECEMBER 31, 1970

UNDER $250M	$250M & LESS THAN $1MM	$1MM & LESS THAN $10MM	$10MM & LESS THAN $25MM	ALL SIZES
	22	43	12	81
%	%	%	%	%
	10.4	5.4	9.5	8.0
	8	3	1.8	1.2
	24.2	33.3	24.5	28.0
	37.1	36.6	35.4	35.9
	2.3	2.5	5.8	4.5
	73.1	78.2	77.0	77.5
	14.8	12.5	16.7	15.0
	5.3	9.3	6.4	7.4
	100.0	100.0	100.0	100.0
	13.9	11.0	22.0	17.6
	18.5	12.7	7.1	9.7
	3.5	2.6	1.6	2.1
	.6	1.2	1.3	1.2
	8.4	11.1	7.8	9.1
	46.5	38.5	39.9	39.6
	2.5	6.3	14.3	11.2
	49.1	44.8	54.5	50.8
	1.4	.5	1.6	1.3
	49.5	54.4	43.6	47.9
	100.0	100.0	100.0	100.0
	100.0*	100.0*	100.0	100.0*
	82.3	80.3	78.9	80.2
	17.7	19.7	21.1	19.8
	17.8	16.7	15.9	16.4
	-.1	3.0	4.2	3.5
	1.6	1.7	1.2	1.5
	1.1	1.1	1.0	1.1
	.6	.6	.8	.7
	2.5	3.0	2.7	2.9
	2.1	2.1	1.8	2.0
	1.6	1.7	1.6	1.7
	.1	.1	.3	.1
	.2	.2	.4	.3
	.4	.4	.4	.4
	.6	.5	.6	.5
	.9	.9	1.9	.9
	1.4	1.5	2.4	1.6
	.5	.5	.5	.5
	.8	.8	1.8	.8
	1.3	1.5	2.2	1.5
34 10.7	39 9.2	51 7.0	38 9.6	
47 7.7	57 6.3	74 4.9	55 6.5	
66 5.5	66 5.5	77 4.7	71 5.1	
44 8.1	51 7.0	84 4.3	59 6.2	
62 5.8	82 4.4	109 3.3	82 4.4	
95 3.8	106 3.4	109 3.3	106 3.4	
7.2	8.9	4.2	7.4	
5.6	5.1	3.9	5.2	
35.5	33.1	4.2	3.7	
6.7	4.3	5.1	6.2	
4.4	4.2	4.2	4.4	
3.6	3.3	3.1	3.3	
24.6	23.7	17.6	21.4	
11.5	14.1	11.1	11.5	
2.7	2.4	4.1	3.0	
10.4	12.1	11.8	12.5	
5.1	6.2	5.9	5.4	
1.4	1.5	.7	1.1	
$34.1M	$319.6M	$340.7M	$465.4M	
13.4M	143.7M	221.2M	376.4M	

Source: Robert Morris Associates, Philadelphia, Pa.

Preceding page blank

cost of effluent treatment as one to one and a half percent of sales, then it would seem feasible for firms to self-finance such expenditures and continue commercial existence even if only part of the cost can be passed on in the form of higher prices. It is interesting to note, however, that the profit rates for firms with sales of less than one million dollars are significantly less than for firms above one million dollars in sales, 4.0 percent as compared to 6.6 percent indicating the higher vulnerability of smaller firms.

Table 1.4G shows the Robert Morris Associates financial figures on the manufacturers of tanning, currying and finishing, and footwear.

Dun and Bradstreet reports were obtained for a representative sample of 65 tanneries. Only 18 of the reports contained complete or almost complete financial data. Table 1.4F lists these 18 statements. The sample probably should not be considered as representative of the industry. Rather, taken with the Morris report, it does show the variability of individual firm's financial conditions.

2.1 Technology of the Tanning Process

The tables below summarize the basic processes utilized in converting hides into leather. However, individual tanneries may use one or more processes in a unique way to manufacture the desired quality of leather. Differences in the quality of leather produced are common and exist even within plants of the same company. These differences are attributed to various controlling factors, including differences in equipment, chemicals, process times, and general know-how. It is these conditions that make it difficult to generalize about the volume and the quality of the effluents generated by an individual tannery. In spite of these differences, there are significant similarities in the processes used by tanneries to manufacture leather. The process flow sheets following are intended to give a general understanding of the sequence of events, the chemicals used, and the by-products generated.

At the beginning of the conversion process, which takes place at currying establishments, the hides are treated with salt or are dried in air to prevent

Preceding page blank

TABLE 2.1A

HARNESS, CASE, SOLE, BELTING AND MECHANICAL LEATHERS

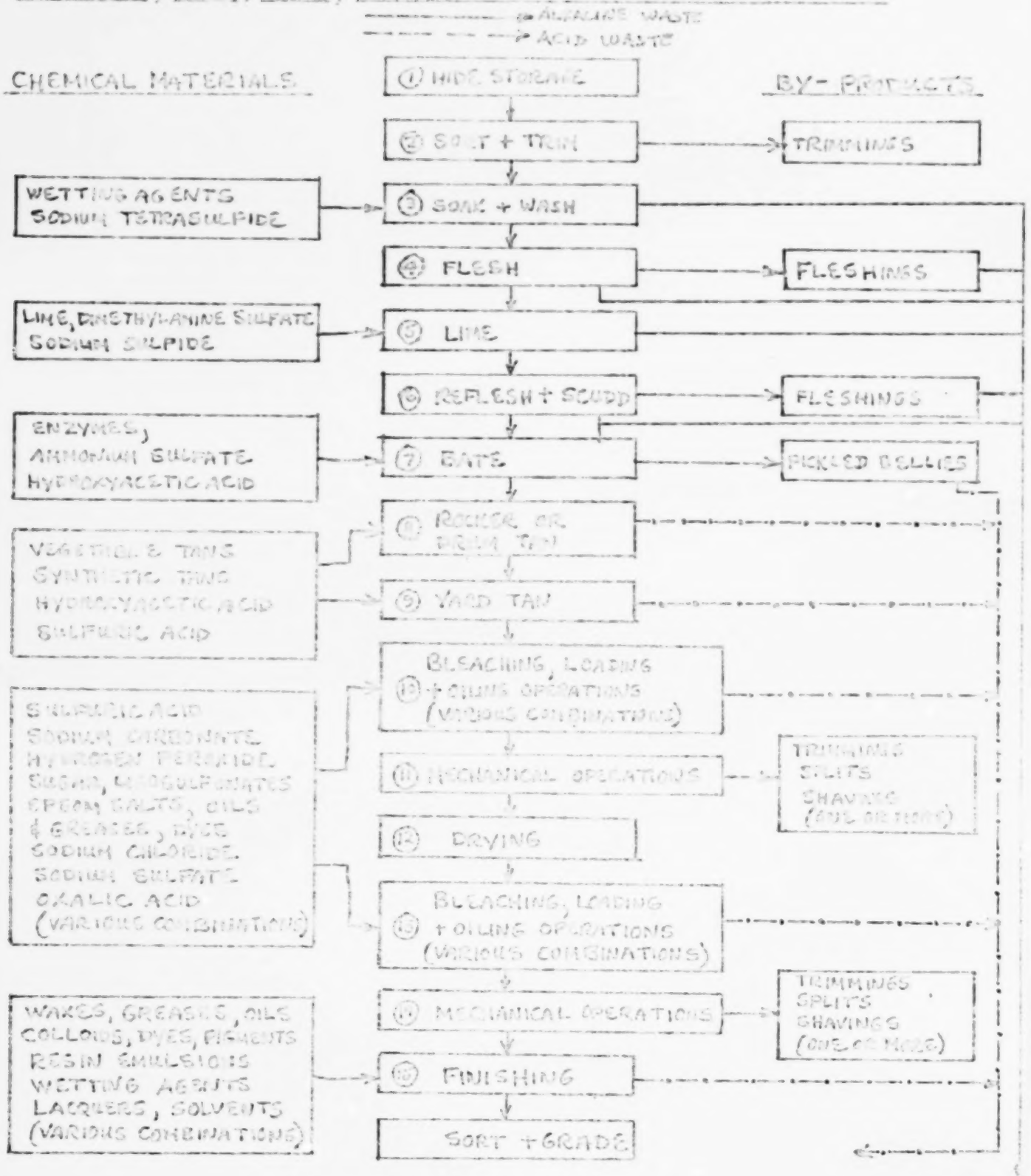


TABLE 2.10

SHEEPSKIN

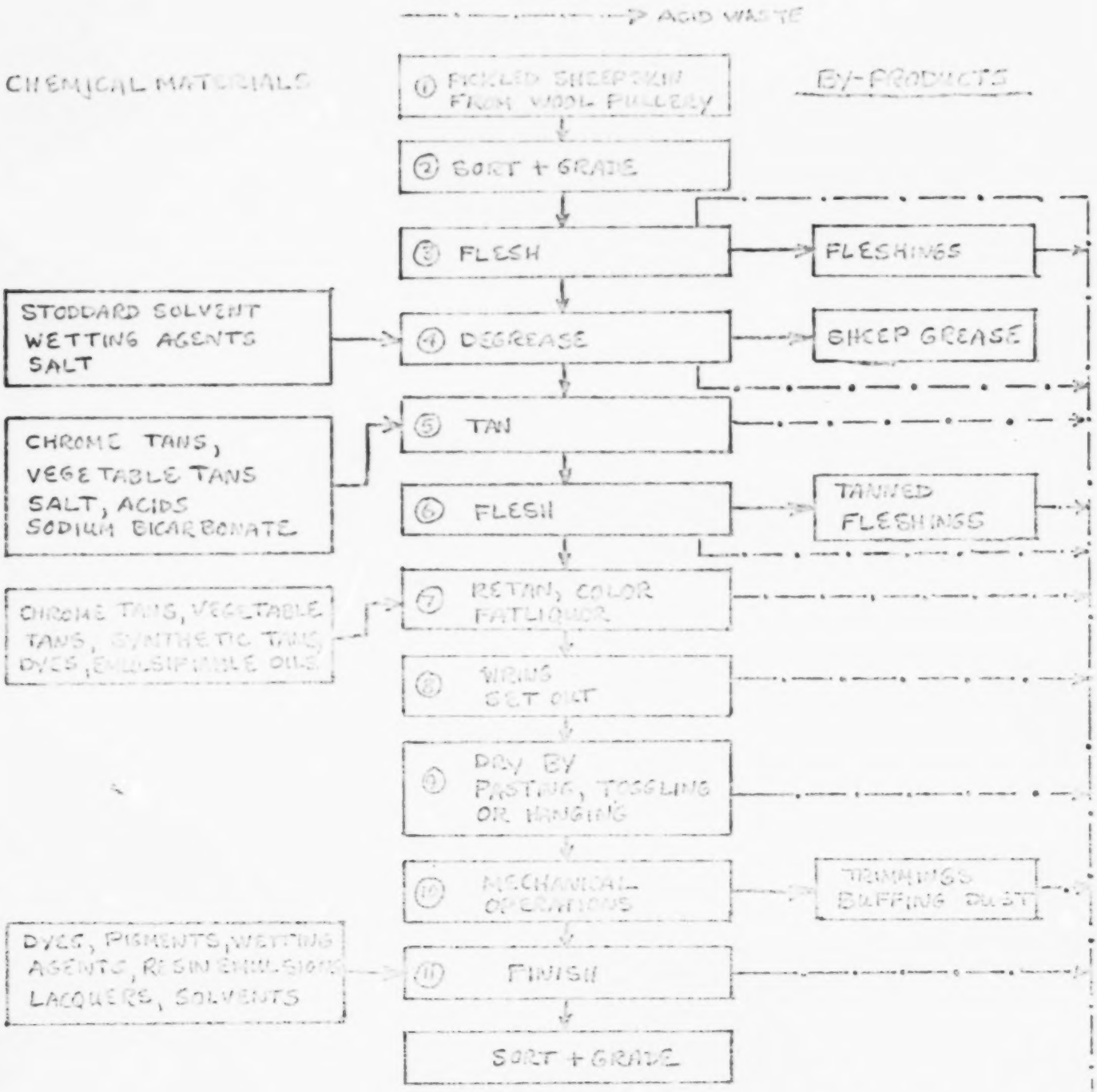
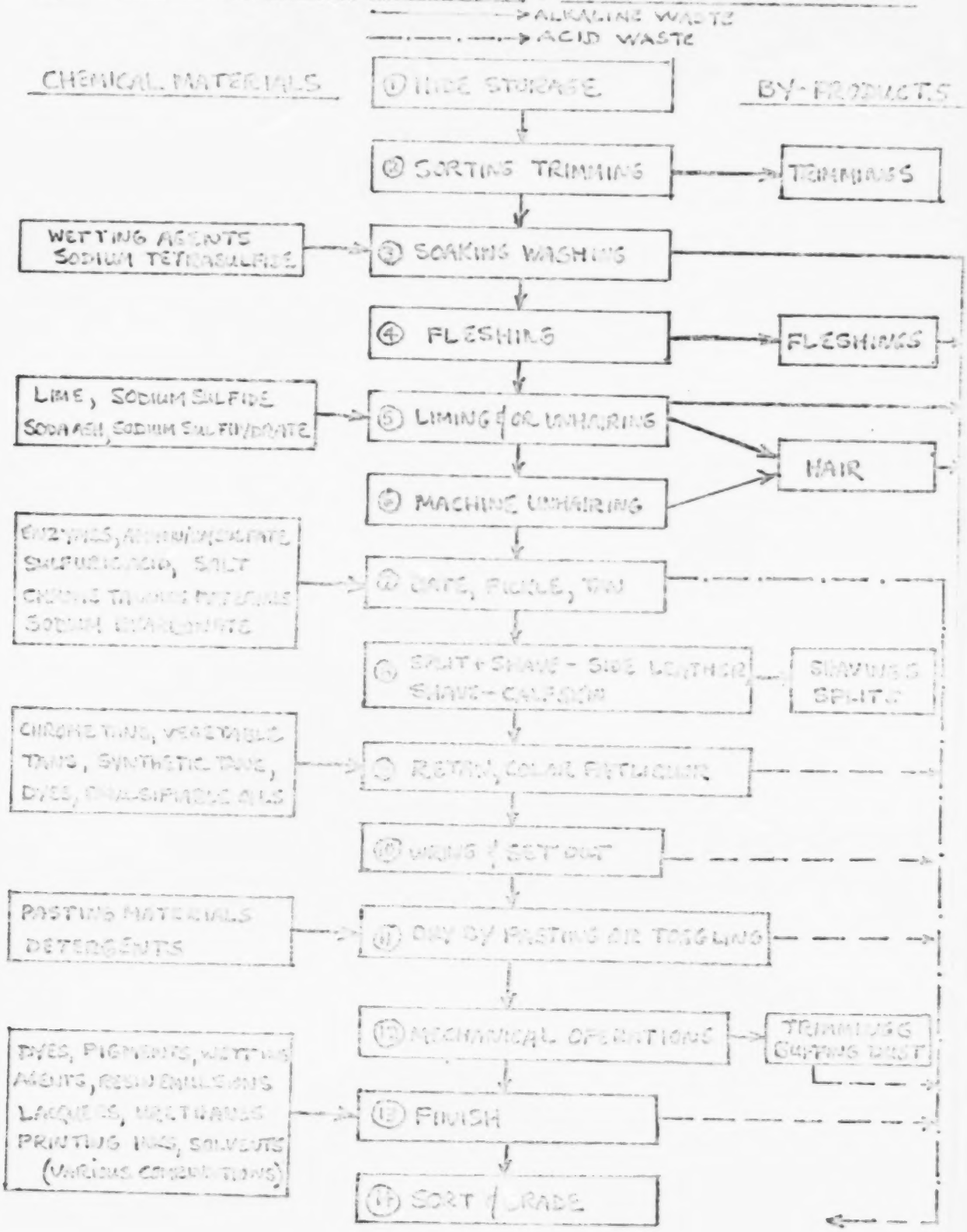


TABLE 2.1C

GENERALIZED TANNERY PROCESS FLOW SHEET

KID & GOAT, PATENT, SIDE UPPER & CALF SKIN UPPER LEATHERS



bacterial degradation. The hides are covered with salt on both sides and stored in layers, draining the brine solutions along with the blood and other organic matter. Smaller hides, especially skins, are usually dried in air--a process limiting the moisture in a hide. However, risks of bacterial degradation and skin damage are high. Brine baths are increasingly used, especially in larger establishments, however, a highly concentrated NaCl waste is generated.

At the tannery, the hides are soaked and washed to remove dirt, salts, manure, blood, and restore the moisture level lost during curing. It is here that the hides are cut into halves, called sides, and are also green fleshed and soaked. Wetting agents, sodium tetrasulfides, as well as salt, are employed in this process.

Following the soaking the hides undergo fleshing, where the remaining tissues are removed. The fleshings are by-products, sold for rendering or conversion to glue.

The next procedure is the unhairing of the hides. The fiber structure is opened as the unwanted protein

is removed during this step. Hair may be removed by machines or chemically--complete destruction (pulping) or dissolution (burning off).

Usually hair pulling is practiced where hair is saved and sold. This, of course, depends upon the current or expected market for hair. In the Northeast, for example, the tendency is to pulp or burn off the hair, requiring strong solutions of lime and sulfides. In the Chicago area, on the other hand, where hair is usually recovered, weak unhairing solutions are used. Weaker solutions, of course, are less pollutinal--containing fewer sulfides.

Bating is done in drums or paddles and it is the process which prepares the hides for tanning. The process involves the use of various enzymes and ammonium sulfate to render the silly, slippery, smooth, more porous and free-of-wrinkles grain in the leather.

Pickling, renders an acidic skin, preventing precipitation of the insoluble chromium salts in the skin fibers during mineral tanning. Pickling, however, can be used as a means of preserving the hides during storage prior to tanning and is widely used in sheepskin tanning.

Tanning is the chemical process of converting the hide fibers into leather. Leather fibers will not putrify when wet but hides, although stable when dry, will rot in moist conditions.

Vegetable and chrome tanning agents are the two principal types used in this country. Vegetable tans--quebracho, wattle, chestnut, eucalyptus, mangrove, myrobalaus, valonia, spruce, oak bark, and others--are used for sole, upholstering, belting, bag, case and strap leathers. This method of tanning takes longer, but it yields more leather and a more workable leather.

Chrome tanning--using basic chromium sulphate--reduces the tanning time to less than a day and produces a softer but more heat-and-moisture-resistant leather. It has been used since the turn of the century for tanning the majority of light leathers.

Following the chrome tanning process, the leather is subjected to several mechanical operations. The hide is split through the middle of its thickness to produce two distinct layers--the top or grain leather which is used for shoe uppers and the flesh side,

the "split," used for suede, shoe linings and a variety of other products. Splitting is a mechanical process and does not involve much liquid waste. The leather is then wrung to extract as much moisture as possible. From here, the leather proceeds into a shaving machine where the back is further leveled and smoothed, by shaving off the unevenness which may be present. Many leathers are buffed also with fine sand papers on either the grain or flesh sides for better quality.

Since vegetable tanning produces leathers which are fuller, plumper and more easily tooled and embossed, leather tanned by chrome method is frequently given a subsequent tan in vegetable tannins. This is called retanning, (modification of the chromium tanned leather properties), and it produces an excellent quality of leather.

Coloring and fat liquoring follow these operations and involve adding many dyes, colors as well as many types of oil, waxes and greases to achieve the desired colors, to prevent cracking and to render a soft, pliable and strong leather.

Coloring and dying of tanned leather may be done either before or after fat liquoring. The dye solutions are dumped at the end of the run or when exhausted.

Pasting is one method employed to dry leather, expecially that used for shoe uppers. The sides are affixed to smooth steel plates which have been sprayed with water dispersible paste. Then the plates with the sides are put through a heated dryer, when moisture is driven out of the leather. After drying, the leather is subjected to a few more mechanical operations before it arrives in the finishing department.

In finishing, various pigments, organic and inorganic are applied to the surface of the leather to give it a uniform appearance and of the shade desired. Plasticizers, waxes, etc., may be added to give the handling characteristics and the surface feel desired.

Sorting and grading of the leather for marketing purposes is the last step.

All of the processes discussed above contribute to the pollutional effluent produced by the tanneries.

A normal sized firm producing in vicinity of 70,000 square feet per day has an effluent profile similar to that shown in Table 2.1D.

It is difficult to effectively treat wastes produced by tanneries because of the make-up of the flow and effluent characteristics during the operating day; the pH level fluctuates greatly and chromium and sulfide concentrations are high. There are also many fungicides and various detergents.

All of the tannery process contribute to the wasteload. The unhairing and tanning processes, however, are highly pollutional. The unhairing wastes are alkaline, milky colored, sulfide laden and contain a minimum of 50 percent of the total BOD and suspended solids.

Tanning wastes, on the other hand, are highly colored, containing acidic concentrations of dissolved organic and inorganic solids, substantial amounts of chromium and detergents.

Such processes, as the shaving and buffing of leather contribute to the wasteload also. In buffing the leather, the dust generated is usually drawn into

Table 2.1 D SUMMARY OF 48 HOUR SURVEY OF TOTAL WASTEWATER DISCHARGE APRIL 9 TO 11, 1968**

	4/9 8:00 am - 4/10 8:00 am	4/10 8:00 am - 4/11 8:00 am	4/9 - 4/11 AVG/DAY
Flow (gpd)	911,000	958,000	934,000
pH Range	5.2 - 12.0	5.0 - 11.6	5.0 - 12.0
Alkalinity to pH 8.3 as $CaCO_3$ (lbs/day)	2,345	3,319	2,832
BOD (lb/day)	8,244	8,880	8,562
Settleable Solids (gals/day)	144,230	116,620	130,425
Total Solids (lbs/day)	75,600	64,280	69,940
Total Volatile Solids (lbs/day)	24,420	16,390	20,405
Suspended Solids (lbs/day)	19,350	14,830	17,090
Volatile Suspended Solids (lbs/day)	12,270	8,980	10,625
Calcium as $CaCO_3$ (lbs/day)	8,160	8,390	8,275
Sulfides as S (lbs/day)	309	519	414
Chromium as Cr (lbs/day)	1,870	1,802	1,836
Hides into soak (lbs, hidehouse wt.)	90,000[1]	121,500	105,750
Hides into lime (lbs, soaked, fleshed wt.)	109,200[2]	101,400[2]	105,300
Hides into tan (lbs, white wt.)	142,800[2]	117,600[2]	130,200
Hides out of tan (lbs, white wt.)	134,400[2]	142,800[2]	138,600

1 1506 of the total 3,936 sides were trimmed and fleshed prior to weighing.

2 6750 lbs of green, salted, untrimmed hides or 6000 lbs of green, salted, trimmed and fleshed hides is equivalent to 7800 lb soaked and fleshed hides and is also equivalent to 8400 lb white weight of hides.

** Water Pollution Control Research Series, "Activated Sludge Treatment of Chrome Tannery Wastes", September 1969.

a wet dust collector. The water used to control and wet the dust can amount to as much as 100,000 gallons a day for a 4,000-side-per-day tannery. Most tanneries install screens to collect the wet dust and allow the recirculation of water. However, if this is not practiced, the hydraulic flow and suspended solids (dust) are exceptionally high.

Dust and shavings clinging on the leather after the shaving process are washed off during the retanning, coloring and fat liquoring process. This contributes substantial amounts of suspended solids to the general tannery flow.

There are many methods available for treatment of the tannery effluents. The best method differs for each plant, depending on such factors as: flow, strength, discharge limitations imposed by regulating agencies, plant location, municipal sewage tie-ins, land available, chemical costs, and many other variables.

TABLE 2.1E

TREATMENT REMOVAL METHODS

In-Plant Treatment	Municipal Treatment
Screening	Primary
Equalization in holding basins	Primary and Trickling Filtration
Sedimentation	
Chemical Coagulation	Primary and Activated Sludge
Lagoons	Primary and Chemical Coagulation
Trickling Filtration	
Activated Sludge	
Sludge treatment by:	
Pressure Filtration	
Lagoons	
Digestion	
Vacuum Filtration	
Incineration	

(For more detailed description of tannery waste treatment, see: Activated Sludge Treatment of Chrome Tannery Wastes, Federal Water Pollution Control Administration, Department of the Interior, September 1969.)

There are several technical issues regarding the cost of treating effluents from the tanning industry. Repeated studies have shown that the least ex-

pensive means of controlling industrial pollution is to reduce the generation of pollution by changing the manufacturing processes. This pattern is clearly true of the tanning industry. Yet the firms have not moved towards making the tanning process more efficient.

There are two reasons for the lack of process improvement. The first is that the tanning industry is not a technically innovative one. Very little money has recently been put into improving its technology. The processes are not well controlled and, in fact, tanneries are notorious for their excess use of chemicals. Tanneries also view their processes not as developing technologies but as secret arts which must be preserved and protected. In short, there is little interest within the industry for carefully examining and improving the tanning process.

The second reason for not having reduced waste generation is that municipalities do not generally charge industry for the marginal cost of treating the industry's waste. Thus, there is no

incentive to the firms for reducing their waste generation. Federal and state grant programs underwriting the construction of treatment plants serving municipalities and industry have in effect been subsidies for pollution generation.

As discussed elsewhere, 80 per cent of the tanneries are, or shortly will be, tied into municipal sewage systems. The remaining 20 per cent of the firms could be seriously impacted by having to bear the entire cost of controling their pollution. We should note at this point that simply using the same cost estimates generated for municipal treatment plants as representing the cost of treating the waste from tanneries in a rural area may not be realistic. The technologies can be considerably different in the two cases. Because the plant is in a rural area, the amount of allowable waste may be considerably higher than for a plant in an urban area. The rural plant may also be able to use larger amounts of land area for much less expensive settling ponds which urban plants cannot use. Rural plants will also not have the solid waste disposal problems of urban plants.

2.2 Beam House Operations

The Prime Tannery in Maine is presently being forced to provide for treatment of its wastes. The firm is a large pollutor in a small town. The town has not been able to get federal support for a treatment plant because almost all of the waste is from the tannery. The firm is now seriously considering closing its "beam house", the defleshing and tanning operations, and moving them to St. Joseph's Missouri, where a municipal treatment facility is available. The finishing activities which employ 250 of the 300 employees would remain in Maine. This seems to be a situation which other tanneries are watching closely. There is a firm in St. Joseph's which is offering to pretreat and tan the hides before shipping them to other tanneries for finishing. The tannery managers with whom we talked did not like the idea of losing control of the tanning process, but they were all quite familiar with Prime Tanner's plans.

Breaking up the production process in this way is one alternative to carrying large capital costs for a new treatment plant. For Prime's plant, 90 per cent of the BOD would be eliminated by transferring the defleshing and tanning out of the plant.

2.3 Chromium Waste

The effluents from chrome tanning contain large amounts of chromium as a waste product. Massachusetts now has a regulation preventing the dumping of heavy metals into municipal treatment systems. The regulation is aimed at metal plating firms but clearly would apply to tanneries. There are no present plans for enforcing such regulations against tanneries even in Massachusetts. None of the cost estimates included in this report would cover the removal of chromium from tannery wastes. In our conversations with water pollution control officials in several states, it was clear that for the most part they were unaware of chromium discharges from tanneries. It is possible that some time in the future states will attempt to regulate chromium and there will be a round of capital expenditures for chromium removal equipment which may have greater impact on the tanning industry than present regulations.

It should be noted that the chromium from metal plating is hexavalent and that from tanning is trivalent. Thus most of the tannery chromium is precipitated out when the effluent is neutralized. The problem for tanneries would appear if the restrictions on chromium waste became severe. It probably would not be a problem if 80 percent removal was sufficient.

2.4 Classification of Tannery Technology

Ralph Stone and Company, Inc. in their report on the leather industry, Industrial Waste Profile, 1967, discussed technology trends in the leather industry and their report is quoted below. The trend since 1963 will have been towards the newer technologies.

> The principal changes in the industry are a trend toward brind cured hides instead of salt cured; a short soak after wash instead of overnight; slight modifications in the unhairing chemicals used; increasing use of drum machines instead of paddle machines in the bating, pickling and tanning operations; and use of chrome splitting instead of lime splitting. Table above indicates the level of technology.
>
> Plant classification. Only 20 percent of today's tanneries were built during the last 20 years. During this time many tanneries also went out of business, mostly the smaller ones. As a result, the industry today can be classified as older in terms of plant age, prevalent (1963) in terms of technology level and tending toward fewer and larger plants. Technology level and plant age do not coincide due to modernization programs.
>
> Our estimate of the percentage of plants falling into the three previously described technological

levels is as follows:

	Technology	
	Older	Prevalent & Newer
Percentage of Plants	20	80

The range of plant sizes connected with these three technology levels are estimated as follows:

	Technology	
	Older	Prevalent & Newer
Plant Size (Hides per day)	Less than 300	Over 300

There is so little difference between the prevalent and newer technologies in the tanning industry that we have simply lumped together newer and prevalent in the foregoing estimates.

The relative proportion of small, medium, and large size plants (as the industry regards plant size) included in each technology level is estimated as follows:

Plant Size	Hides No/day	Percent Plants of This Size	Percent of Plants This Size in Technology Level	
			Older	Newer & Prevalent
Small	300	10	55	45
Medium	300-800	50	30	70
Large	800	40	5	95

Table 2.4A

Technology Level

Older 1950	Prevalent 1963	Newer 1967
Salting of Hides	Salting of Hides and Brined Hides	Brine Cured Hides or Salted Hides
Wash and Overnight Soak	Wash and Short Soak	Wash and Short Soak
Green Fleshing	Green Fleshing	Green Fleshing
Unhair Na_2S + $Ca(OH)_2$	Unhair Na_2S + $Ca(OH)_2$	Unhair $[(CH_3)_2\ NH]_2 \cdot H_2SO_4$ Some $NaSH$ + Na_2CO_3
Lime Fleshing	-	-
Lime Splitting	-	Little Lime Splitting
Paddle or Drum Bating	Paddle or Drum Bating	Drum Bating or Paddle Bating
Paddle or Drum Pickling	Drum Pickle	Drum Pickle
Chrome Tan in Drums or Paddles or Rocker Veg.Tan + Layer Veg. Tan	Basic Chromic Sulfate Tan in Drum Machine -	Basic Chromic Sulfate Tan in Drum Machine -
Chrome Splitting	-	Mostly Chrome splitting
Retan, Color Fatliquor	Retan, Color, Fatliquor	Retan, Color, Fatliquor

3. The Cost of Treating Tannery Waste

3.1 Introduction

This study has taken a different approach to the control cost aspect than originally planned. Considerable effort has been devoted to obtaining actual cost data because it turns out that the costs vary widely within the industry and is at times at variance with the cost data supplied by EPA. In addition, the important differential impact of the costs is between firms within the industry and not between the tanning industry and other industries or imports. As a whole there is almost a zero elasticity of demand for leather. Therefore, the important question is what happens within the industry, and the study of cost data focused on this aspect. It seems clear that the industry as a whole can pass on the two to three percent price increase which would result in the worst case from pollution control costs.

Present state and federal water pollution control programs and regulations have significant differential impact on the firms within the tanning industry. Firms in Milwaukee, Newark, Peabody and Salem, Mass., and Gloversville-Johnston, New York, for example, are now paying little or no direct sewer charges and there are

Preceding page blank

currently no plans to impose any charges. These firms, which make up a large percentage of the tanning industry, will probably experience little or no increased cost of production due to pollution control costs in the next two or three years.

Firms in Chicago have experienced relatively heavy charges because of new sewer regulations which require pretreatment and charge firms in proportion to their waste flow and its composition. The typical costs for these firms for waste control is somewhat over one percent of sales.

There are a smaller but important number of firms which are in small towns and are required to put up joint town-tannery treatment plants. These firms have had to raise large amounts of capital as their share of the construction costs. A New Hampshire company with annual sales of $10,000,000 contributed $700,000 toward the cost of constructing the treatment plant. The annual added cost of production for these firms including operation costs and debt maintenance is approximately one percent of yearly sales. These joint projects are all receiving state and federal financing for 80 to 85 percent of the construction

costs. In a study done by Camp, Dresser and McKee[1] of one of the joint projects, the cost to the tannery without state and federal capital assistance would be about three percent of sales.

The final group of firms consists of those in rural areas where they cannot tie into a muncipal treatment system. While it may seem that these firms face the most severe control costs because they can receive no public funds for constructing treatment facilities, interviews with 20 percent of the firms showed this not to be the case. All of the firms interviewed were undertaking much less expensive treatment projects using large amounts of land area. The companies reported that they were achieving secondary treatment with these methods.

It is difficult to generalize for these firms because each one is a special case, but it seems that they are now experiencing less cost impact than the firms in municipal systems like Chicago. As noted above the cost of building and operating a treatment plant similar to those built for municipalities would be three percent of sales.

---

[1] Activated Sludge Treatment of Chrome Tannery Wastes, U. S. Department of the Interior, Water Pollution Control Research Series, ORD-5.

The assumption is made in the Economics of Clean Water data which was supplied for this study that all tannery wastes will receive secondary treatment. This is not necessarily the case. The cost differences for different levels of treatment at higher treatment levels are very significant. If the treatment levels are properly set, the level of treatment required will be a function of the assimilation characteristics of the receiving body of water and the amount of waste from other sources. Quoting average costs may be misleading or in any case uninformative when there are 150% variations in the costs for particular plants.

At least for larger tanneries the Cost of Clean Water estimate of yearly costs is also about one percent of sales. For smaller firms the estimate is about two percent of sales.

3.2 Municipal Charges to Tanneries

We have seen that a majority of the tanning firms in the United States are,or shortly will be, tied into municipal treatment systems. Most of these firms are already paying for the service. The questio

is what changes will there be in the charge structure which could affect financial conditions of the tanneries.

Most treatment systems are supported by general revenues or by charges which are a percentage of the users' water bill. Chicago and a few other localities are attempting to charge users more in proportion to the firm's contribution to the waste. Table 3.2 A lists a number of these charge schemes.

Tanneries will not be affected if the municipality in which they are located does not change their charge structure; the firms will experience no pollution control cost increase. This pattern is likely to be the case for many if not most of the tanners in the country for the next few years.

One would hope, at least in terms of sensible waste management, that this practice will eventually change. Legislation now before the Congress could significantly affect these charge schemes. The Chicago and Lebanon, New Hampshire, charges are shown in the table. We do not know how closely these charges come to equalling the marginal cost of treating the

waste from each firm but apparently this is the intention of the charges.

In addition to the sewer usage charges, municipalities may require some level of pretreatment from the firms. Most firms are already doing some pretreatment, particularly solids removal and flow regulation. Screening is very common. The real impetus for pretreatment comes when the firms face municipal charges approximating the costs of treating their waste. At this point there will be additional investments in pretreatment facilities and even process changes. If the Chicago charges are representative of realistic municipal treatment costs, all tanneries connected to municipal systems can expect eventually to face user charges equal to about .6 cents per square foot of leather produced where the leather typically sells for $.60 per square foot in 1971.

The Federal Water Pollution Control Act Amendments of 1971 which have now been passed by the Senate would end the 80 percent subsidy of the industry's share of treatment plant construction costs by requiring firms using a municipal facility to also pay back their share of the 80 percent of capital costs covered by state and federal funds instead of just their share of the final 20 percent which must now be

TABLE 3.2A

NAME OF FIRM & LOCATION	AMOUNTS PAID BY VARIOUS TANNERIES FOR THE USE OF MUNICIPAL SEWAGE SYSTEMS.	
A. C. Lawrence Leather Co. Peabody, Mass.	Webster Street Plant	Main Street Plant
	Nov. 1970 $ 375.11	227.48
	Dec. 430.38	322.12
	Jan. 1971 319.18	259.78
	Feb. 299.41	268.41
	Mar. 348.64	279.22
	April 331.80	226.16
	May 288.36	259.70
	June 318.34	308.48
	July 256.03	306.00
	Aug. 303.19	197.16
	Sept. 429.43	311.31
	Oct. 344.16	186.77
	TOTAL 4,044.03	3,152.59
Sirois Leather Co. Peabody, Mass	Quarterly Billings:	
	Oct. 1970 - Jan. 1971	167.34
	Jan. - Apr.	133.23
	Apr. - July	150.68
	July - Oct.	137.60
	TOTAL	$590.85

TABLE 3.2 (cont.)

NAME OF FIRM & LOCATION	AMOUNTS PAID BY VARIOUS TANNERIES FOR THE USE OF MUNICIPAL SEWAGE SYSTEMS.
Drew Leather Co. of Brockton* Brockton, Mass.	Bi-Annual Charges: Jan. 1970 142.50 July 1970 142.50 Jan. 1969 142.50 July 1969 142.50 *This firm was billed on arbitrary "average" till 1971
Barrett Leather Co. Newark, N.J.	Mar. 1971 thru Sept. 1971: Charges: $8,870.94
Setru Leather Co. Newark, N.J.	March 1971 thru Sept. 1971: Charges: $4,147.56
Ocean Leather Co. Newark, N.J.	March 1971 thru Sept. 1971: Charges: $2,160.41
Geilich Tanning Co., Inc. Taunton, Mass.	Charges for 1970: $70.00

TABLE 3.2A (cont.)

NAME OF FIRM & LOCATION	AMOUNTS PAID BY VARIOUS TANNERIES FOR THE USE OF MUNICIPAL SEWAGE SYSTEM	
Victory Tanners, Inc. Peabody, Mass.	Quarterly Billings:	
	Oct. 1970 - Jan. 1971	172.33
	Jan. - April	328.58
	April - July	323.98
	July - Oct. 1971	310.43
	TOTAL	1,135.32

TABLE 3.2 A (cont.)

NAME OF FIRM & LOCATION	AMOUNTS PAID BY VARIOUS TANNERIES FOR THE USE OF MUNICIPAL SEWAGE SYSTEMS	
Allied Kid Co.	April 1968	$2,066.66
	to	1,167.63
Wilmington, Del.	April 1969:	4,658.00
		3,716.00
		2,416.00
		2,780.00
		$16,803.00
Mid Tennessee	Nov. 1970	41.51
Tanning Co.	Dec. 1970	41.64
Shelbyville,	Jan. 1971	39.13
Tennessee	Feb. 1971	46.25
	Mar. 1971	34.04
	April 1971	31.55
	May 1971	29.41
	June 1971	37.92
	July 1971	33.00
	Aug. 1971	38.85
	Sept. 1971	30.70
	TOTAL	404.00

TABLE 3.2 A (cont.)

NAME OF FIRM & LOCATION	AMOUNTS PAID BY VARIOUS TANNERIES FOR THE USE OF MUNICIPAL SEWAGE SYSTEMS.
Berlin Tanning & Manufacturing Co. Berlin, Wisc.	Annual Billing for 1970: $9,005.41
Moench Tanning Co. Cowanda, N.Y.	Quarterly Billings: October 1969 - January 1970 $157.51 January - April 162.55 April - July 174.85 July - October 1970 167.74
Pulping Leather Co. Fond du Lac, Wisconsin	For 1970: Basic Sewer Charge: $24,760.79 Surcharge: 10,732.85 *Pre-treatment: 38,045.57 TOTAL $73,589.21 *Pre-treatment of tannery wastes is done at municipal treatment plant.

TABLE 3.2B

LOCALITY	SEWAGE CHARGES FOR INDUSTRIAL FLOW BASED ON WATER CONSUMPTION *SURCHARGE **PRE-TREATMENT REQUIRED
Wilmington, Delaware	The sewer charges are based on water consumption 0-2,500 ft^3 @ $2.01 /1,000 ft^3 2,500-5,000 ft^3 @ 1.2300/1,000 ft^3 5,000-20M ft^3 @ 1.10 /1,000 ft^3 20M -50M ft^3 @ 0.685 /1,000 ft^3 50M & over @ 0.390 /1,000 ft^3
Chicago, Illinois	Chicago has a system of surcharges effective March 1, 1971. It does not have specific sewer charges. Surcharges are: Liquid - 0.021/1,000 gallons--deduct 10,000 per day plant operation 5-Day BOD-014/per pound- deduct of proportional amount of the total that would be combined in 10,000 per day. Suspended Solids-.0235/lb--deduct the proportional amount that would be contained in 10,000 gallons per day. Deductible allowance for domestic wage of employees @ industrial plant: $0.004 per employee per day worked.

TABLE 3.2 B (cont.)

LOCALITY	SEWAGE CHARGES FOR INDUSTRIAL PLOT BASED ON WATER CONSUMPTION *SURCHARGE **PRE-TREATMENT REQUIRED
Newark, N. J.	Sewer charges are 75% of water consumption 1st 500 ft^3 @ .35¢/100 ft^3 next 9,500 ft^3 @ 22.5¢/100 ft^3 next 90,000 ft^3 @ 20¢/100 ft^3 from 100,000 to 400,000 ft^3 @ 17.5¢/100ft^3 over 500,000 ft^3 @ 15¢/100 ft^3 Newark does not have a treatment plant nor any plans to build such a facility in the future.
Shelbyville, Tennessee	The sewer charges are based on 75¢ of water consumption. There is a minimum charge of $5.55/1/2 year for the use of the system. Sewer charges are: 1st 5,000 ft^3 @ 21¢/100 ft^3 next 10,000 ft^3 @ 18¢/100 ft^3 next 85,000 ft^3 @ 100¢/100 ft^3 next 900,000 ft^3 @ 8.25/100 ft^3 over 1M ft^3 @ 5.15/100 ft^3 Surcharges: Class A - BOD & SS @ 300 ppm or less 75% base rate Class B - BOD & SS @ 300 ppm non-residential 113% base rate Class C - BOD & SS up 750 ppm non-residential 127% base rate Class D - BOD & SS greater than 750 ppm non-residential 167% base rate

TABLE 3.2 B (cont.)

LOCALITY	SEWAGE CHARGES FOR INDUSTRIAL FLOW BASED ON WATER CONSUMPTION *SURCHARGE **PRE-TREATMENT REQUIRED
Berlin, Wisconsin	Sewer charges are based on industrial flow 24.5¢/1,000 gallons of flow.
Peabody Mass.	Sewer charge based on water consumption .03/1,000 gallons straight minimum charge of $6.50 per 1/4 year Charges after the treatment facilities commence operations will remain the same.
Salem, Mass.	No sewer charges presently
Brockton, Mass.	Sewer charges are based on the water consumption- Sewer charges are: 1st 36,000 ft^3 @ 20.5¢/100 ft^3 over 36,000 ft^3 @ .12¢/100 ft^3 The intensity of the flow is not considered.

TABLE 3.2 B (cont.)

LOCALITY	SEWAGE CHARGES FOR INDUSTRIAL FLOW BASED ON WATER CONSUMPTION *SURCHARGE **PRE-TREATMENT REQUIRED
Fond du Lac, Wisconsin	Sewer charges based on 65% of water consumption. Water charges are: 1st 5,000 ft^3 @ .36/100 ft^3 next 20,000 ft^3 @ .25/100 ft^3 next 75,000 ft^3 @ .18/100 ft^3 over 100,000 ft^3 @ .11/100 ft^3 Surcharges are imposed for excessive BOD and suspended solids content @ 1.15¢/lb and 1.10¢/lb, respectively. The normal content is estimated @ 300 ppm. Pre-treatment of flow is done at the municipal treatment facility, industry incurs the cost.
Gowanda, N.Y.	Sewer charges are based on water consumption. Minimum charge: $4.50/3 months or up to 9,000 gallons Next 16,000 gal. @ .36/1,000 gal. Next 50,000 gal. @ .17/1,000 gal. Up to 2.75M gal. @ .06/1,000 gal. Over that amount .03/1,000 gal.

covered by the municipality. If this legislation is enacted, future user charges to firms would be higher. In line with the Camp, Dresser, and McKee estimate, the typical charges to firms using new treatment plants will be in the range of 2.5 percent to 3.5 percent of the per unit selling price of leather. If the new regulations only apply to new expansion portions of existing facilities, the new costs will be less.

In section 2.5 the possibility is discussed that at some time in the future the tanning industry may experience regulations which would prevent their dumping chromium into municipal sewer systems. There are no present plans to meet such a regulation nor are there any estimates as to the cost of removing chromium from tannery wastes. Some pretreatment processes now remove a majority of the chromium, but it would be expensive to remove all of it. We want to identify this source of possible future costs which would have to be bourne entirely by the tanning industry.

3.3 Cost of Joint Town-Tannery Treatment Facilities

Several joint town-tannery treatment plants have been examined to determine the total project costs and

how the costs are allocated between the town and the tannery. The tannery's cost per unit of leather production was then calculated. Table 3.3 a lists the data.

It is important to note that the Camp, Dresser and McKee Report, Activated Sludge Treatment of Chrome Tannery Wastes reports a 1.6 cents per square foot of leather capital and operating costs. This number has been quoted as the cost to the tanning industry of waste treatment in joint town-tannery projects. The 1.6 cents is actually the total cost of the project. The tanneries share of the cost is .5 cents per square foot. The cost to other tanneries involved with similar projects is about the same.

The pattern for allocating the project costs between the town and the tannery varies. In general, however, the formula was for each element of the project to be listed and its cost allocated according to what proportion of its total use the tannery or town received. For the operating cost and items on which there was no clear delineation, the cost was proportioned at a rate equal to the average of the flow and BOD contributions of the tannery and the town.

TABLE 3.3 A

COSTS OF JOINT TOWN-TANNERY TREATMENT FACILITIES

ITEM	PLANT-A(1969)	PLANT B(1971)	PLANT C(1967)	PLANT D(1973)	PLANT E(1968) Primary Treatment
Total Cost	$2,175,000	$4,808,000	$1,644,000	$2,515,000	$1,291,200
State & Fed Costs	1,740,000	4,086,000	978,400	2,012,000	1,040,000
Tan. Cost	300,000	722,000	667,600	503,000	234,000
Tan. O.C.	63,000	90,000	76,000	65,000 (est.)	31,500
Town's O.C.	27,000	40,000	n.a.	65,000	3,500
Tan. Flow	934,000gpd	1.25mgd	600,000gpd	300,000gpd	1.3mgd
Town's Flow	n.a.	1.10mgd	300,000gpd	300,000	
B.O.D. (tan)	8,562 lb/day	22,500 lb/d	12,000 lb/d	1,200 lb/d	13,200 lb/d
B.O.D. (town)			400 lb/d	400 lb/d	
S.S. (tan.)	17,090 lb/day	11,560 lb/d			18,000 lb/d
Cr (tan.)	1,836 lb/day	1,120 lb/d			500 lb/d
Output	19.3×10^6 ft^2	30×10^6 ft^2	20×10^6 ft^2	20×10^6 ft^2	193×10^6 ft^2
Employment	250	350	250	250	250-275
Tannery Cost/ft^2	$.005/ft^2	$.006/ft^2	$.007/ft^2	$.006/ft^2	$.003/ft^2

TABLE 3.3 A (cont.)

Cost of Joint Town Treatment/ Facilities

Item	Plant F (1969)
Total Cost	$5,895,000
State & Federal Costs	$4,703,000
Tan. Costs	$ 187,000
Tan. O.C.	$ [illegible]
Town O.C.	$ 34[illegible],300
Tan Flow	300,000 gpd
Town Flow	5.07 mgd
Tan B.O.D.	2,000 lb/d
Town B.O.D.	6,210 lb/d
Tan. S.S.	4,500 lb/d
Town S.S.	7,360 lb/d
Output	7,026,000 ft^2
Employment	100
Cost/ft^2	.0075/ft^2

The essential result of the investigation is that the costs to the tanneries are 1 percent to 1.5 percent of leather selling price and that these are costs which the tanneries are willing to accept.

3.4 The Cost of Treatment for Rural Tanneries

The final group of firms consists of those which are in rural areas and cannot tie into a municipal treatment plant. On the basis of the Camp, Dresser, and McKee cost estimate of the A.C. Lawrence plant in Maine, one could say that if the treatment plant had been built without state and federal support, it would have cost the tannery about three percent of yearly sales.

However, in practice rural tanneries have been building less expensive treatment facilities using lagoons. The lagoons require large amounts of land area which plants in municipalities do not have available. It is possible that rural firms could face a three percent cost but only one possible instance has been found.

Sole leather tanneries have the most difficult waste to treat. The president of a rural sole leather plant with 250 employees was interviewed and he reported

that in the last four years his firm had spent $250,000 for lagoons and anarobic and aerobic treatment equipment. His yearly operating costs including sludge removal are about $50,000 which he estimates at one cent per square foot of leather. The unit cost estimate seems high at three percent, but in any case these are the worst circumstances for rural tanneries. This particular firm has continued in operation with these costs for several years. Though the firm's president did not feel that the government understood tanners problems, he did not feel immediately threatened by pollution control costs.

The costs experienced by other rural tanneries have been lower than that of the sole tannery. The typical costs are less than one percent. Capital costs for the treatment facilities of $100,000 for a plant with 200 employees is typical. All of the firms reported that they were achieving secondary treatment with their facilities.

Apparently rural tanneries except perhaps the very smallest will not experience excessive waste control costs. In many cases their costs may even be less

than firms in cities like Chicago. However, this situation would change if the rural tanneries faced much stricter effluent standards or the elimination of certain specific effluents such as chromium were required necessitating much more sophisticated treatment facilities.

3.5 Air Pollution and Solid Waste Disposal

Most of the cost data discussed in this report has referred to the costs of water pollution control. The tanning industry has also been concerned somewhat with air pollution and to a larger extent with solid waste disposal.

Tanneries buff and polish the leather as part of the finishing process and a certain amount of dust is produced. They have expended small amounts of funds over time on dust control. Some tanneries are quoting large air pollution control costs, but these really represent purchases of new boilers. There are also localized chemical fumes but no expenditures for their control have been identified.

Solid waste is more complicated because much of the solid waste removal costs have appeared as

part of the water pollution costs. Sludge removal is a solid waste cost but is part of the water pollution control operation. In some areas such as Chicago where solid waste disposal is difficult the removal of solid waste can be a very important element of the total waste control costs. One Chicago firm paying $150,000 per year sewer surcharges is also paying $40,000 for solid waste removal.

3.6 Cost of Clean Water Data

The cost data generated for this study as part of the Cost of Clean Water report deserves some comment.

One's first reaction must be a strong element of skepticism in cost data to which 150 percent uncertainties are attached. There is also not a clear distinction between the cost of treating tannery wastes and what tanneries are paying for the treatment of their waste. The treatment plants actually being built for treating tannery waste are substantially more expensive than suggested by the supplied data. But the actual costs to the tanneries are somewhat less than the supplied data; the differences being the capital subsidy program.

The Cost of Clean Water data could be useful in one important respect and that is in giving some thoughts on the shape of the cost as a function of flow curve. We were not able to get sufficient cost data on small plants to say anything about the economies of scale of waste treatment. For the most part, the new cost data collected for the study was from firms with 100 or more employees. This is a minority of the tanneries in the country though it includes 80 percent of leather production.

Table lists the supplied costs with estimates of the plant sizes in employment. The employment figures were calculated from the average flow per employee for larger firms which is about 3280 gal. per employee day. The plant sales figures were calculated using the average value of sales per employee of $30,000.

The Cost of Clean Water estimate of annual costs to tanneries with 1.0 mgd flow is slightly less than one percent of annual sales. The annual figure for tanneries with .1 mgd flow is two percent of annual sales. These are firms employing 30 people. We have no insight into the validity of these numbers.

But if they are correct they reinforce the impression that the very smallest tanneries will face the largest waste control costs and be in the weakest position to bear the costs.

Table 3.6 A

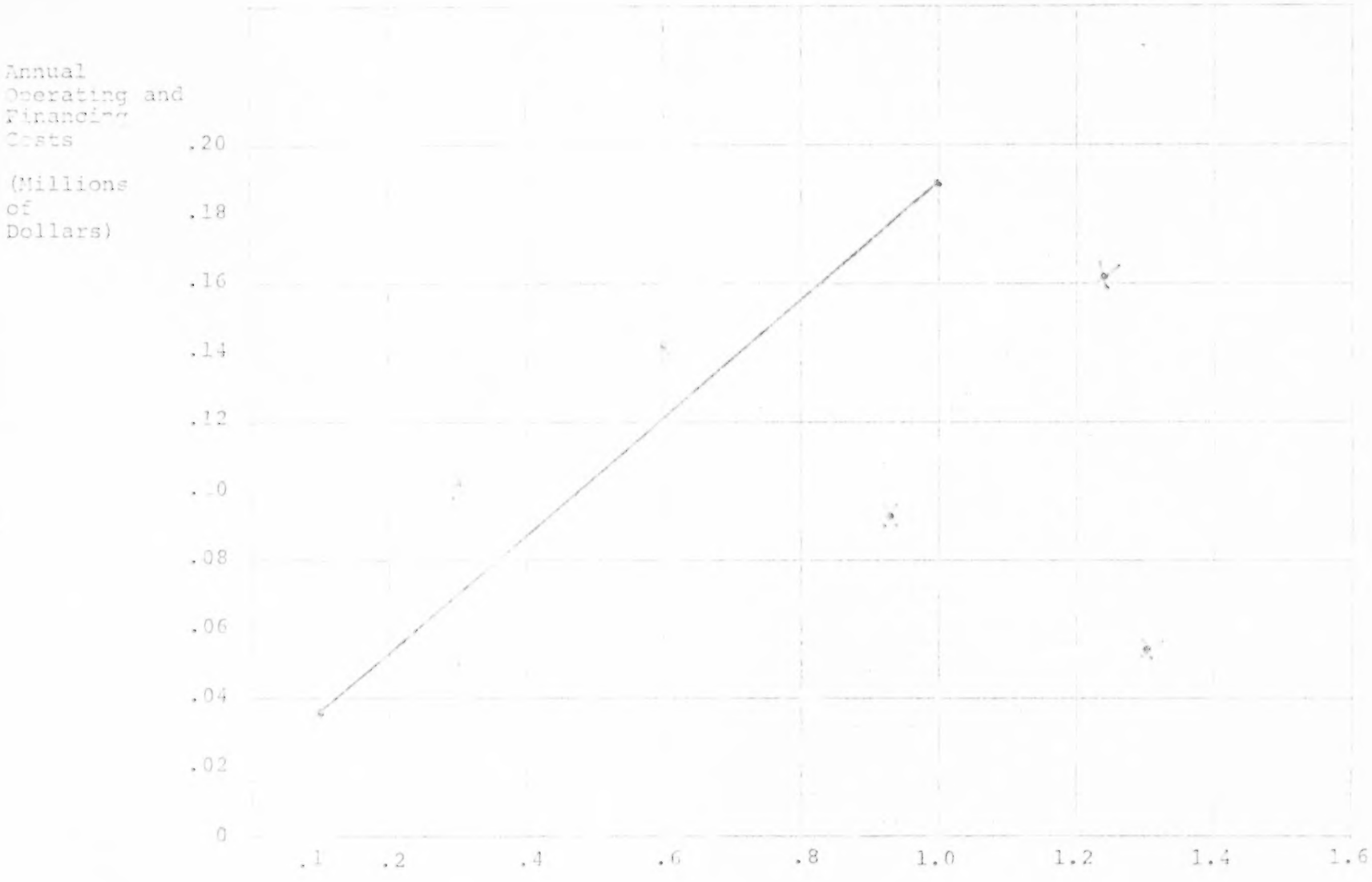
Water Pollution Control Costs

($ Million)

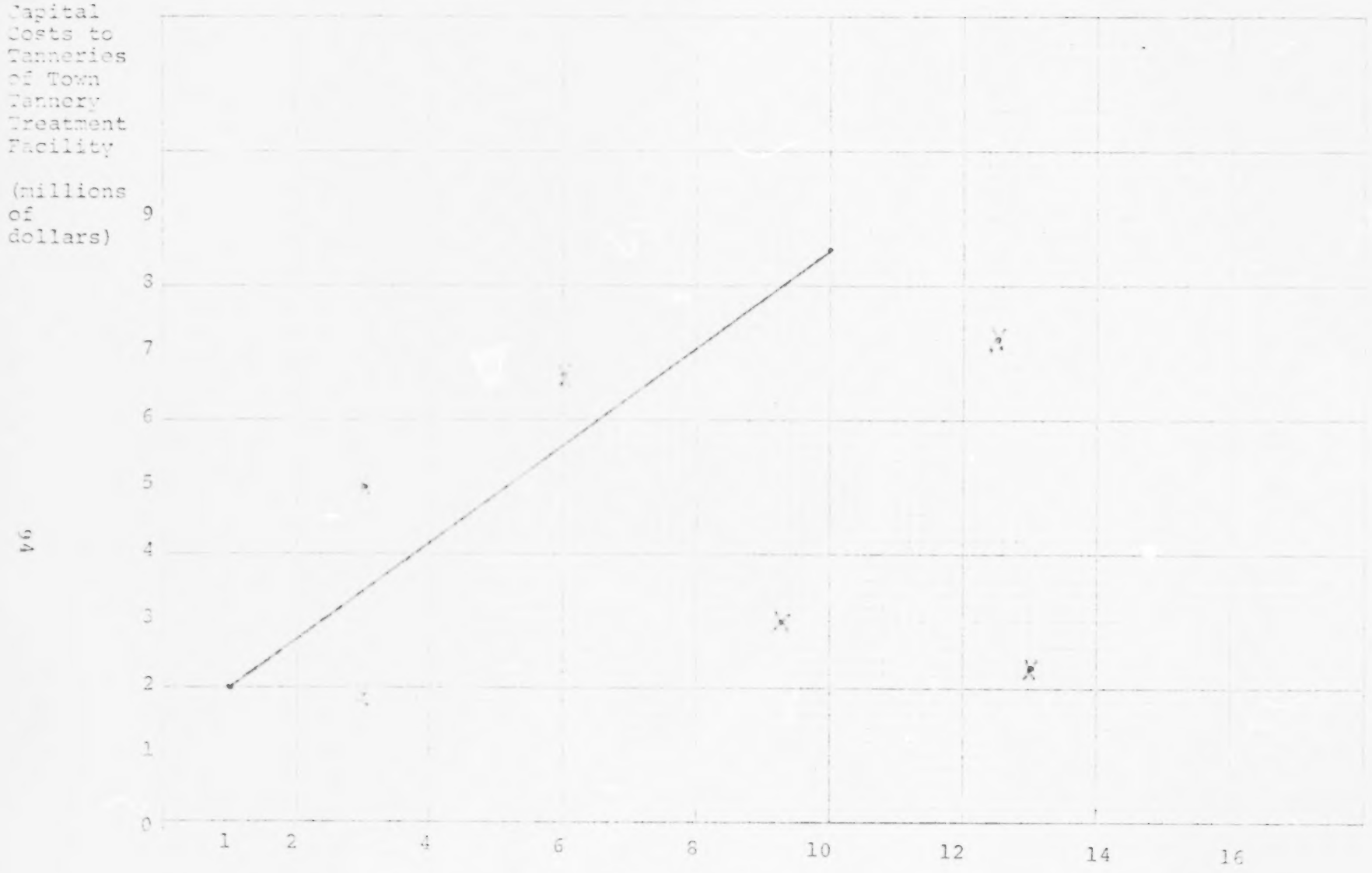
Tannery Flow	Employment	Annual Sales	Investment	Annual Costs			
				Operations and Maintenance	Interest	Depreciation	Total
.1 Million gal. per day	31	.915	.209	.012	.016	.010	.030
1 Million gal. per day	305	9.15	.855	.082	.065	.042	.189

Source: EPA, Cost of Clean Water, 1971.

Note: The cost data was supplied with an upper bound uncertainty of 150 percent and a lower bound uncertainty of 50 percent.



Note: the heavy line is the cost of clean water estimate and the x's are actual costs.



Note: the heavy line is the cost of clean water estimate and the x's are actual costs.

4. Shoe and Hide Industry Description

4.0 Shoe and Hide Industry Description

4.1 Description of the Shoe Industry

In 1970, there were 560 shoe manufacturers in the U.S operating 950 establishments. This represents a decline from the 1963 level of 1083 establishments and that of 1968, when there were 1100 establishments.

The industry consists of many small firms located in numerous towns and cities throughout New England and the mid-Atlantic states. Recently, there have been a number of mergers, involving mainly small and medium-sized firms. Conglomerates have been acquiring some of the medium sized firms, while the larger firms have been diversifying into gloves, garments and luggage.

The U.S consumption of non-rubber shoes has been steadily increasing since the mid 1950's, with a noticable interruption in 1967. This is a function both of increasing population and increases in the per capita disposable income.

Leather and part-leather shoes still account for about 80% of total leather consumption in the U.S and for a majority of the shoe consumption. Nevertheless there has been a very considerable decline in the usage of leather in shoe production, as illustrated by the tables at the end of this section. Synthetics, such as vinyls and polyurithanes captured an increasing share of the market.

Representatives of the industry offer a number of reasons for this trend. Man-made materials are less expensive per square foot, easier to work with, and more easily adaptable to machine processing. Consequently, much of the response to the increasing penetration of imports has been to shift into synthetic shoe production. This is particularly true of the women's or l misses' sections of the shoe market.

Despite the disadvantages of leather usage, leather manufacturers think that leather will not lose to the man-made substitutes. The recent failure of Dupont's Corfam is sighted as proof. There is a certain snob appeal and tradition which makes leather shoes more desirable to the consumer. Shoe manufacturers have as yet been reluctant to substitute synthetics for leather in men's and boy's shoes, above the $12 market regardless of the cost savings, because of uncertainty as to consumer acceptance of synthetics.

However, it must be noted that the quality of man-made materials has been improving and there

are synthetics produced which have physical and aesthetic properties previously attributed to leather only. Polyporics, for example, are light and flexible, have "breathing" and shape retention features and reflect the shoe fashion trends in colors, grains, and finishes. Moreover, these materials offer the shoe manufacturers certain technological advantages--high frequency molding, reproducing upper parts or complete uppers from sample stitched uppers, and uniform width and thickness reducing the labor costs in the cutting and lasting room processes. In higher priced shoe markets, where the price of leather and polyporics are similar--55¢-60¢ per square foot--a 10 percent gain in area of material and a 70 percent reduction in labor costs can be realized by using polyporics.

The lower priced shoe markets, including casual wear, are largely dominated by vinyls. Vinyls, although lacking many of the leather-like qualities, are inexpensive--$.20 per square foot--and offer the shoe manufacturers gains in area and reductions of labor costs similar to those mentioned for polyporics.

The American footwear industry invests very little of its own funds towards research and development in the production of shoes. Shoe machine manufacturers, however, are introducing new methods, new technologies, and new machinery for shoe production. These manufacturers are concentrating on the development of total machinery systems, utilizing computers to decrease the rising costs of labor, to increase productivity, and to meet the quick change-over demands of fashion.

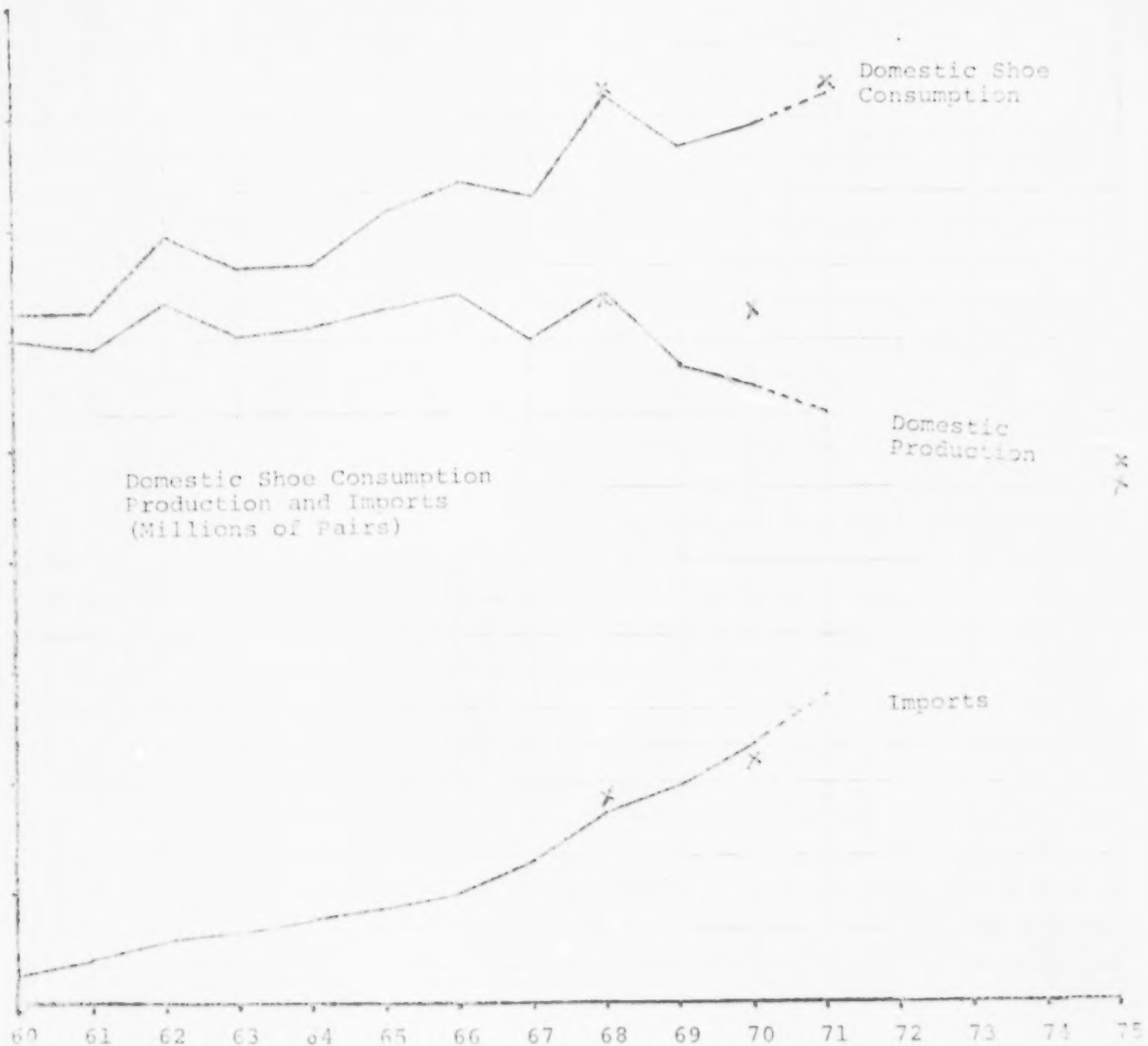
Substantial research has been devoted to machinery systems dealing with leather. However, greater concentration has been devoted to the systems utilizing vinyls and polyurithanes. From this pattern of investment it is apparent that they feel there will always be a place in the shoe market for leather, but an increase in the share of shoe production will be in the vinyl and polyurithane sectors.

It is expected that the high priced men's shoe market will be dominated by leather in the future, provided style and desirability are emphasized. This is based mostly on consumer snob appeal and tradition and such recent technological improvements.

as coating leather with urithane, enabling various pieces of upper materials to fuse. This eliminates the stitching process for uppers, yielding labor cost savings to the manufacturer.

As discussed earlier, the growth of shoe imports has been a dominant factor in reducing the production of American shoes and hence the demand for, and production of, American leather. The tables below detail the impact of imports by price and type of shoe.

CHART 4.1 A
Domestic shoe consumption, production & importation



x- projections made by the American Footwear Manufacturers Association

Table 4.1 A

Domestic Shoe Consumption, Production and Importation

(millions of pairs)

	Market (Consumption)	Production (incl. exports)	Import
1960	623.2	600.0	26.6
1961	626.5	592.9	36.6
1962	693.3	633.2	55.0
1963	664.1	604.3	62.8
1964	685.3	612.8	75.3
1965	714.2	626.2	87.6
1966	740.2	641.7	96.1
1967	730.0	600.0	129.1
1968	817.7	642.4	175.2
1969	772.5	577.0	195.4
1970	794.9	559.2	235.6

TABLE 4.1 B

United States Shoe Production
(Millions of Pairs)

Year	Men's	Women's & Misses	Juvenile	Slippers & Misc.	Military	Total	Total Imports
1960	101.	320.	93.4	86.0	3.40	600.	26.6
1961	103.	313.	91.7	85.3	4.50	593.	36.7
1962	113.	325.	95.6	100.	5.90	633.	55.1
1963	111.	311.	88.3	94.7	5.20	604.	62.8
1964	120.	308.	88.7	96.1	6.50	613.	75.4
1965	118.	316.	91.6	100.	7.69	626.	87.6
1966	127.	320.	90.7	104.	15.8	642.	96.1
1967	124.	286.	86.1	105.	14.8	600.	129.
1968	126.	317.	83.6	116.	9.90	642.	175.
1969	117.	267.	78.8	114.	6.85	677.	195.
1970	118.	251.	71.4	119.	4.77	559.	236.

TABLE 4.1 C

U. S. IMPORTS OF LEATHER & VINYL FOOTWEAR BY TYPES

(million pairs)

	Men's & Boys'	% Domestic Production	Women's & Misses'	% Domestic Production	Infants' & Children's	% Domestic Production
1960	7.2	5.8%	14.4	4.5%	0.9	1.3%
1961	9.1	7.1	21.9	7.0	1.4	2.1
1962	14.7	10.6	37.7	11.6	2.7	3.9
1963	13.9	10.3	39.0	12.6	2.5	3.9
1964	15.1	10.4	51.1	16.6	5.1	8.1
1965	17.0	11.8	53.8	17.0	5.9	8.9
1966	18.1	11.9	66.1	20.7	6.2	9.4
1967	22.6	15.2	93.6	32.8	7.5	12.3
1968	30.8	20.6	125.4	39.6	9.2	15.3
1969	38.7	27.6	130.4	48.8	13.3	23.9
1970	49.8	35.0	153.3	61.1	15.1	31.8

TABLE 4.1 D

Leather Usage in Shoe Production

Year	Total Production Million Pairs	Leather Soles Million Pairs	% Total	Leather Uppers	% Total	Part Leather Uppers	% Total	Non-Leather Uppers	% Total
1960	600	163	27.2	458	76.4	40	6.7	101	16.9
1961	593	156	26.3	469	77.6	33	5.6	100	16.8
1962	633	152	25.8	466	79.0	33	5.7	91	15.3
1963	604	143	25.4	436	77.4	30	5.3	97	17.3
1964	613	161	26.2	467	76.2	24	4.0	121	19.8
1965	626	154	24.6	474	75.7	25	4.0	127	20.3
1966	642	159	24.8	474	73.9	26	4.0	141	22.1
1967	600	130	21.7	428	71.4	19	3.1	153	25.5
1968	642	112	17.4	418	65.1	20	3.1	204	31.8
1969	577	85	14.8	400	69.3	14	2.5	163	28.2
1970	559	90	16.1	370	66.2	19	3.4	170	30.4

Table 4.1 E

Projection of Synthetic Substitution for Leather in Shoes

(Percentage)

Category	1968	1970	1971	1972	1973	1974	1975
Domestic Production							
Vinyls & Fabrics	26	22	23	26	28	31	35
Poromerics	4	4	4	3	3	3	3
Leather	70	74	73	71	69	66	62
Imports							
Leather	49	51	51	52	53	53	54
Non-leather	51	49	49	48	47	47	46

Source: Internal estimate made by shoe machine manufacturer.

4.2 The Hide Industry

Hides are a by-product, in most cases, of slaughter for meat production. Hence the quantity of hides produced is a function, not of expected hide demand, but of meat production. It seems that all potential hides, i.e., the hide of each piece of cattle slaughtered, reaches the market. Supply in any one year is quite inelastic.

The most curious phenomenon in the industry is the enormous variability of prices, unaccompanied by any shift in either domestic supply or total demand. Since hides are traded on an international market, it is the total of domestic and foreign demand and supply that is relevant. This is well illustrated by the figures for 1963-1964. Argentina's exports of cattle hides, almost none of which reach the United States', fell from 11.1 million hides to 7.8 million hides. Correspondingly, United States exports of hides rose from 8.0 million to 11.5 million. Yet, the United States price fell from 9.0 ¢ per pound to 7.9¢ per pound, despite matching exogenous shifts in

domestic supply and total demand. In 1966, on the other hand, with Argentine exports rising by 1.3 million and United States exports rising by only .9 million, the price for hides rose 46%. Clearly, there are some very important expectational effects needed to account for this.

Cattle hides, though the major hide form, is only one of many types used in the industry. Others include calf, sheep, lamb, goat, kid, and kangaroo. The United States exports cattle hides, approximately 30 per cent of total production, but is dependent on imports for most of the other categories, e.g., 50 per cent of its lambskins, 99 per cent of goat and kid skins.

Cattle hides are a homogeneous commodity. Tanners purchase hides in large quantities without attempting to specify quality. Their inventories of hides are small, approximately 4-6 weeks supply. Hence, there are, as expected, very large month-by-month price variations, even at times when the annual averages are moving only slightly. The tanneries are

in the position of pure price takers, the price being established impersonally by total world supply and demand.

Tanners buy their hides either directly from the suppliers or/and through hide brokers. In recent years, hide brokers have diminished in numbers and in importance, due to the innovations and improvements in communications, transportation and technology in the various stages of the industry. Many, however, have diversified their operations to include collecting, storing, curing and semi-processing hides. In their new capacity, broker-collectors offer the tanning industry a wider variety of hides to meet their leather needs. As an extension of these broker-collectors, a new industry has developed in recent years--wet blue hide processing. The hides, in this industry, are prepared up to the tanning stages at a cost of about $3.50 per hide. This amount is equivalent to the cost incurred by tanners for the same treatment. However, there are certain advantages offered to the leather manufacturers: saving of $.20 per hide in freight charges due to the removal of wastes; a better selec-

tion of hides; elimination of the beamhouse operations, hence the reduction of a considerable amount of pollutional discharge, and production of more finished leather.

Presently, the wet blue hide processors are contracting work for slaughter houses (hide departments) and various tanneries. It is expected that their market will eventually expand as more tanneries, under financial pressures, eliminate their beamhouse operations and concentrate on finish leather.

This industry has invested large amounts in plant equipment and in research to streamline its operations, thereby meeting future market demands. It has also invested in waste treatment facilities as required by federal and state environmental agencies.

Furthermore, these broker-collectors are located at key shipping points (along the Mississippi River, for example) and provide a system of uniform freight charges to the buyers.

Freight charges vary greatly depending on the location. Thus, for the East Coast, the freight rate from the river points in Missouri is estimated at $2.60 per 100 pounds. The freight costs from the

West Coast to the East Coast are about 25-35 per cent higher for comparable weights. Therefore, most of the West Coast produced hides are shipped to Japan, whose freight rates average $1.75 per 100 pounds.

Tanners now deal with a fewer number of suppliers and brokers to obtain the necessary hides for their orders. Thus, a company like A.C. Lawrence Leather in Peabody, Massachusetts, may deal with 50 instead of 200 suppliers and with 20 instead of 50 brokers.

It is believed that there are certain advantages to this practice for both sides: the tanners will receive better and more reliable service whereas the suppliers can count on a uniform demand for their hides. (Little doubt exists that the hides will be sold).

Factors influencing hide purchasing are many--price, freight charges, selection to meet certain leather orders, and reliable service. Other factors, such as the size and age of the steer, are

influential in that they determine the type of leather that will be produced. For example, leather for garments (thin leather) would come from an old, lean steer whose leather has been "stretched" throughout its years. Seasonal factors have minimal influence since most of the hides are pre-cured and washed before being sold.

TABLE 4.2A

CATTLEHIDE PRICES

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Aver.
1960	14.8	14.9	14.8	14.1	14.1	12.7	12.3	11.0	11.1	10.9	11.4	11.2	12.8
1961	11.1	11.3	14.1	14.4	14.1	13.8	14.3	16.3	16.4	15.3	15.6	14.8	14.3
1962	15.7	14.6	14.6	14.4	14.1	13.3	12.9	12.7	12.7	12.8	12.5	12.1	13.5
1963	11.8	10.9	10.8	10.0	9.9	7.8	8.2	8.0	7.7	8.0	7.8	7.3	9.0
1964	7.0	6.8	7.1	7.3	7.3	7.3	8.0	8.5	8.8	9.2	8.5	8.3	7.9
1965	8.3	8.4	8.8	8.8	9.3	9.3	10.0	11.5	10.8	11.1	11.3	11.8	10.0
1966	13.1	15.5	16.8	15.9	16.1	16.4	15.6	15.8	14.1	11.9	11.7	12.3	14.6
1967	12.3	12.0	11.3	10.5	10.3	10.1	9.5	8.5	8.9	8.4	8.4	8.4	9.9
1968	8.0	7.8	8.1	8.3	8.3	8.3	8.3	8.4	9.0	9.3	9.4	9.8	8.6
1969	9.8	9.8	10.3	12.7	13.0	12.8	12.7	12.3	12.8	12.6	12.0	11.3	11.8
1970	11.3	11.3	11.3	11.7	10.8	9.6	9.3	9.3	9.3	9.3	9.0	8.5	10.1
1971	8.3	8.3	8.8										

TABLE 4.2b

	Estimated Total Slaughter of Cattle (1000 hides)	Net Exports of Cattle Hides (1000 hides)	Total Movement To Tanners* (1000 hides)	Argentine Exports of Cattle Hides and Kips (1000 hides)	Cattle Hide Prices (Cents per pound)
1955	28,257	5,530	25,537	NA	8.4
1960	27,590	6,568	22,044	NA	12.8
1961	28,012	7,351	22,271	NA	14.3
1962	28,516	6,708	22,585	NA	13.5
1963	29,800	7,612	21,815	11,096	9.0
1964	33,262	11,226	22,799	7,821	7.9
1965	34,550	13,019	23,241	6,811	10.0
1966	35,260	13,984	23,572	8,185	14.6
1967	35,381	11,634	23,607	8,658	9.9
1968	36,506	12,359	23,617	8,302	8.6
1969	36,675	14,513	21,096	8,265	11.8
1970	36,500	14,844	20,199	7,506	10.1
1971	NA	NA	NA	NA	8.5 (ave. Jan-March)

* Includes both domestic and foreign hides and side leather kips.

DATA APPENDIX

DATA APPENDIX

At this stage of the project, we have been able to obtain specific lational data on only 170 of the 258 tanneries employing 20 or more workers. The data are listed on the following pages.

Explanation of Code Used on Plant Listings

Magnitude of Pollution Problem:

1. Have greatest pollution problem.

   Process: unhairing and vegetable tanning

   Products: sole leather, upholstery, bag, case, and strap.

2. A lesser problem than 1.

   Process: unhairing and chrome tanning

   Products: side leather (for shoes)

3. A lesser problem than 2.

   Process: dying and finishing; no unhairing

   Products: sheepskins, splits, shearlings.

4. A lesser problem than 3.

   Process: may be some retanning

   Products: insoles, outsoles, splits

5. Very little pollution problem.

   Process: finishing -- spray, flowcoating

   Products: various

Type of System:

I. Independent plant - does not tie in to municipal system and no plans or expected opportunity to do so.

M. Municipal plant - PM - planned municipal plant

	No. of Est.	Mag. of Poll. Problem					Type of Plant		Est. Emp.
		1	2	3	4	5	I	II	
NORTHEAST									
New England	65		27	31		5	11	44	5710
Maine	9		5	4			4	4	1415
New Hampshire	14		7	6		1	3	9	1175
Vermont	1		1				1		NA
Massachusetts	39		14	21		4	3	31	3120
Middle Atlantic	55	15	37	1			7	43	5345
New York	21	1	19	1			1	18	2390
New Jersey	23	4	17					23	1470
Pennsylvania	11	10	1				6	2	1485
SOUTH									
South Atlantic	16	8	5	2		1	5	8	1715
Delaware	5		3	1		1		5	565
Virginia	3	3					1	2	300
West Virginia	3	3					2		200
N. Carolina	2	1		1				1	150
Georgia	1	1					1		250
Florida	1		1						NA
Maryland	1		1				1		250
E. & W. So. Central	12	5	3	3		1	1	4	970
Tennessee	8	2	2	3		1	1	1	660
Kentucky	3	3						3	300
Texas	1		1						10
NORTH CENTRAL									
E. No. Central	37	5	25	6	1		1	31	6055
Ohio	3	3							270
Michigan	3		3					3	750
Indiana	2	2					1	1	65
Illinois	9		9					10	1500
Wisconsin	20		13	6	1			17	3470
W. No. Central	4	2	2					4	350
Minnesota	1		1					1	250
Iowa	1		1					1	100
Missouri	2	2						2	NA
WEST	12		12				2	9	1190
Colorado	1		1						30
Utah	1		1				1		15
Oregon	1		1				1		150
California	9		9					9	995
TOTALS	199	35	111	43	1	7	27	143	21335

Of these companies 82 had 20-99 employees; 65 had 100-249 employees; 20 had 250-499; and 4 had 500 or more employees.

PLANT (By Location)	PRODUCT LINE	OUTPUT	MAGNITUDE OF POLLUTION PROBLEM	TYPE OF TREATMENT FACILITY	EMPLOYMENT (est.)
CALIFORNIA					
Berkley					
Manasse-Block Tanning Co.	chrome & combination sides	900 sides	2	M	75
Los Angeles					
Los Angeles Tanning Co.	calf, kips, sides & splits, deer, shoe, glove, novelty, bag	--	2	M	60
Sierra Pine Trading Co.	hides, sides & split shoe leathers	2,000 sides	2	M	150
Remis (parent company) Vernon Leather Co.	side leather	3,600 sides	2	M	275
Napa					
Calnap Tanning Co.	sides & splits	1,000 sides	2	M	80
San Francisco					
Legallet Tanning Co.	side & split leather deer, glove, & kid goat glove & garment	1,000 sides 1,000 skins	2	M	110
Metten & Gebhardt Inc.	kips & sides	400 sides	2	M	45

PLANT (By Location)	PRODUCT LINE	OUTPUT	MAGNITUDE OF POLLUTION PROBLEM	TYPE OF TREATMENT FACILITY	EMPLOYMENT (1,000's)
CALIFORNIA (continued)					
Santa Cruz					
A.K. Salz Tannery Inc.	glove & line upper linings	--	2	Y	150
South San Francisco					
Poetsch & Peterson	various	600 sides	2	Y	50
			California sub-total		995

PLANT (By Location)	PRODUCT LINE	OUTPUT	MAGNITUDE OF POLLUTION PROBLEM	TYPE OF TREATMENT FACILITY	EMPLOYMENT (est.)
COLORADO					
Delta					
Western Tanning Co.	sides and splits	(250 Elk (775 Deer (240 Cattle	2	I	26
DELAWARE					
Wilmington					
Allied Kid Co. (Parent Company)					
Specialty-New Castel Div.	sides	n.a.	2	M	250
Standard-Sterling Div.	sides	n.a.	2	M	150
Del-Tan Corp.	sides	n.a.	2	M	n.a.
Diamond State Tanning Co.	sheepskin	7200	3	M	100
Wilmington Enameling Co. (Parent Company)					
Seton Leather Co.	patent finishing	3000	5	M	65
			sub-total:		565
FLORIDA					
Sebring					
Highlands Leather Corp.	sides, splits	250	2	I	24

PLANT (By Location)	PRODUCT LINE	OUTPUT	MAGNITUDE OF POLLUTION PROBLEM	TYPE OF TREATMENT FACILITY	EMPLOYMENT (est.)
GEORGIA					
Duford					
Tandy Corp. (Parent Co.)					
Bona Allen Inc.	vegetable-tanned sides	800	1	I	260
ILLINOIS					
Chicago					
Wm. Greiner Co.	sides, splits, garment	2000	2	M	200
Gutmann & Co.	sides, shoe upper leather, bag, case, strap	5,000	2	M	300
Hoffman-Stafford Tanning Co.	glove-type sides	[illegible]00 sides	2	[illegible]	85
Horween Leather Co.	shoe side & horse, sporting goods & mechanical leathers	50,000 ft^2/ mo.	2	M	200
Huch Leather Co.	shoe & specialty leathers	550	2	M	80
Lamkin	--	--	2	M	small
A.H. Ross & Sons Co.	sides	350	2	M	75
Superior Tanning Co.	sides, shoe leather, garment	1500	2	M	225
Weil & Eisendrath Co.	sides, colt, horse, pigskins, shoe & glove leather	--	2	M	75
		Illinois sub-total			1165

PLANT (By Location)	PRODUCT LINE	OUTPUT	MAGNITUDE OF POLLUTION PROBLEM	TYPE OF TREATMENT FACILITY	EMPLOYMENT (est.)
INDIANA					
New Albany					
August Barth Leather Co.	vegtable-tanned sides	80	1	M	30
Geo. Moser Leather Co.	vegetable-tanned sides	250	1	I	90
IOWA					
Muscatine					
Wolverine World Wide Inc.	pigskin	n.a.	2	M	100
KENTUCKY					
Ashland					
Swift and Co. (Parent Co.)					
A.C.Lawrence Leather Co.	sole	500	1	M	110
Auburn					
Caldwell Lace Leather Co.	various	n.a.	1	M	100
Middlesboro					
Middlesboro Tanning Co.	various	7500 hides/ week	1	M	225
				Kentucky subtotal:	535

PLANT (By Location)	PRODUCT LINE	OUTPUT	MAGNITUDE OF POLLUTION PROBLEM	TYPE OF TREATMENT FACILITY	EMPLOYMENT (1,000)
MAINE					
Berwick					
Prime Tanning Co. Inc.	sides, shoe leather	9200 hides/ day	2	P	230
Clinton					
Bosse Bros. Inc.	sheepskin	2100	3	M	35
Camden					
Camden Tanning Corp.	sheepskin, garment suade, and shoe linings	4200	3	I	100
Canton					
Brindis Leather Co. Inc.	sheepskin	120	3	I	25
East Wilton					
Willard Helburn Inc. (Parent co.)					
Wilton Tanning Co.	sheepskins	6000	3	I	100
Hartland					
Irving Tanning Co. (Parent Co.)					
Hartland Tanning Div.	kips, sides, splits	2750	2	P	340

PLANT (By Location)	PRODUCT LINE	OUTPUT	MAGNITUDE OF POLLUTION PROBLEM	TYPE OF TREATMENT FACILITY	EMPLOYMENT (est.)
MAINE (Continued)					
Howland					
Irving Tanning Co. (Parent Co.)					
Pine Tree Division	sides (closing plant)	3000	2	I	200
Saco					
Kirstein Leather Co.	sides	7550	2	PM	500
South Paris					
Swift and Co.					
A. C. Lawrence Leather Co.	sides	3500 sides	2	"	250
			Maine Subtotal		1775
MARYLAND					
Williamsport					
W. D. Byron and Sons, Inc.	sides	800	2	I	120
MISSOURI					
St. Louis					
California Tanning Co.	vegetable tanning	200	1	M	33
Herman Oak Leather Co.	vegetable tanning	NA	1	M	70

PLANT (By Location)	PRODUCT LINE	OUTPUT	MAGNITUDE OF POLLUTION PROBLEM	TYPE OF TREATMENT FACILITY	EMPLOYMENT (est)
MASSACHUSETTS					
Brockton					
A. and B. Tanning Corp.	lining, bellies	700	3	M	162
Barbour Welting Co., Inc.	tanning & carrying for own use	n.a.	3	M	35
Drew Tanning of Brockton Inc.	splits, linings, garment leathers	200	3	PM	20
Norwich Leather Co.	various	600	3	M	55
Danvers					
Creese and cook Co.	kips and sides	3000 sides	2	M	190
Grafton					
Hickey Leather Co.	double shoulders	1000	n.a.	n.a.	n.a.
Haverhill					
L.H. Hamel Leather Co.	kid and sheep linings and uppers, garment suede, lamb		3	M	100
Hoyt and Worthen Tanning Co.	Sheepskins, patent, chamois, etc.		3	I	60

PLANT (by Location)	PRODUCT LINE	OUTPUT	MAGNITUDE OF POLLUTION PROBLEM	TYPE OF TREATMENT FACILITY	EMPLOYMENT (est)
MASSACHUSETTS, continued					
Lawrence					
Bettencourt Tanning Co.	splits	3000	3	I	30
Lynn					
Carr Leather Co.	calf kips, sides, shoes and upholstery leather	400	2	M	70
Newburyport					
Newbury Tanning Corp.	splits	700	3	M	80
North Adams					
Wilden Co.	sides	135 & 1600 shoulders	2	PM	100
Peabody					
Ferman Tanning Corp.	splits	800	3	M	100
Gnecco and Grilk Tanning Co.	sheepskin	3600	3	M	100
H.D.C. Leather Co., Inc.	sheepskin	300	3	M	50

PLANT (by location)	PRODUCT LINE	OUTPUT	MAGNITUDE OF POLLUTION PROBLEM	TYPE OF TREATMENT FACILITY	EMPLOYMENT (est)	
MASSACHUSETTS, continued						
Peabody, continued						
A.C. Lawrence Leather Co. Swift and Co.						
Calfskin Tannery	calf, . .	2,000 sides	2	M	250	
Sheepskin Tannery	sheepskin	36,000 doz.	3	M	80	
Patent Tannery	patent	1,250 sides	2	M	80	
Patent Finishing	finished patent	2,500	5	M	60	
Modern Leather Co.	side leather	500 sides	2	M	100	
Polypat Leathers Inc.	finishing	n.a.	5	M	160	
Seskas Leather Co.	sheepsplits (about to close)	n.a.	3	M	13	
Silva Tanning Co., Inc.	sheepskin	150 doz	3	M	30	
Sirois Bros. Inc.	sheepskin	600 doz.	3	M	120	
Phenny Smidt Leather Co.	finishers (about to close)	100	5	M	6	
Strauss Tanning Co., Inc.	splits	1000	3	M	40	
Verza Tanning Co.	sides		2	M	100	max
Victory Tanning Corp.	sides	1000	2	M	39	(?)

PLANT (by Location)	PRODUCT LINE	OUTPUT	MAGNITUDE OF POLLUTION PROBLEM	TYPE OF TREATMENT FACILITY	EMPLOYMENT (est)
MASSACHUSETTS, continued					
Salem					
Beverly Leather Finishing Co.	finishing	500	5	M	20
Crestbard Tanning Co.	splits	300	3	M	30 (incl. p -t)
Flynn, John & Sons	sheepskin	n.a.	3	M	100
Kroy Tanning Co., Inc.	sheepskin (closed one plant 1971)	8000	3	M	100
Leach-Meckel Leather Co.	sides	1000	2	M	90
Pioneer Tanning Co., Inc.	sheepskin	1200	3	M	20-24 (?)
Salem Suede Inc.	sides	900	2	M	60
Taunton					
Geilich Tanning Co.	sides	1500	2	PM	300
Westboro					
Westboro Tanning Co.	sheepskin	2400	3	n.a.	30
Woburn					
Murray Bros. Tanning Co., Inc.	sides	500	2	M	40

PLANT (by Location)	PRODUCT LINE	OUTPUT	MAGNITUDE OF POLLUTION PROBLEM	TYPE OF TREATMENT FACILITY	EMPLOYMENT (est)
MASSACHUSETTS, continued					
Woburn, continued					
John J. Riley Co.	sides	1500	2	M	150
Worcester					
E.W. Parks Co.	sides	1500	2	M	40

PLANT (By Location)	PRODUCT LINE	OUTPUT	MAGNITUDE OF POLLUTION PROBLEM	TYPE OF TREATMENT FACILITY	EMPLOYMENT (est.)
MINNESOTA					
Red Wing					
S.B. Foote Tanning Co.	sides	5000	2	M	250

PLANT (By Location)	PRODUCT LINE	OUTPUT	MAGNITUDE OF POLLUTION PROBLEM	TYPE OF TREATMENT FACILITY	INVESTMENT ($ cost.)
MICHIGAN					
Grand Haven					
Trostel Industries (Parent Co.)					
Eagle Ottawa Leather Co.	sides	3000	2	M	300
Rockford					
Wolverine World Wide Inc.	pigskin	n.a.	2	M	200
Whitehall					
Genesco Inc. (Parent Co.)					
Whitehall Leather Co.	sides	3500	2	M	250
			Michigan subtotal:		750
NEW JERSEY					
Camden					
Delaware Valley Tanning Corp.	sides	1200	2	"	60
John R. Evans and Co.	kid	18000	2	"	250
Gold Brand Leather Co.	sides	130	2	M	25
Surpass Leather Co.	(out of business) sides	NA	2	"	150
			Camden Subtotal		485
Edgewater					
H. Schwarz Leather Co. Inc.	sides	750	2	"	100

PLANT (By Location)	PRODUCT LINE	OUTPUT	MAGNITUDE OF POLLUTION PROBLEM*	TYPE OF ORGANIZATIONAL FACILITY	EMPLOYMENT (est.)
NEW JERSEY (Cont.)					
Englewood					
Hackettstown					
Lackawanna Leather Co.	upholstery	210	1	M	70
Middletown Leather Co.	Upholstery	150 hides	1	"	30
				Subtotal	100
Hoboken					
R. Neumann and Co.	sides	NA	2	"	small
Newark					
Barrett and Co. Inc.	sides	2000	2	M	125
Dermatan Leather Co.	sides	NA	2	M	10-30
Goldsmith Leather Co. Inc.	specialties	NA	2	M	200
Guttenstein & Co., Inc.	sides	1000	2	M	80
Leon Leather Co., Inc.	sides	1000	2	M	80
Rich. Neumann Tannery Inc.	specialties	NA	2	M	NA

PLANT (By Location)	PRODUCT LINE	OUTPUT	MAGNITUDE OF POLLUTION PROBLEM	TYPE OF TREATMENT FACILITY	EMPLOYMENT (1958)
NEW JERSEY, (Cont.)					
Newark (Cont.)					
N.J. Tanning Co. Inc.	bag, case & strap	330 hides	1	"	50
Ocean Leather Co.	sides	1000	2	"	150
Seton Co. (Parent Co.)					
Radel Lea. Mfg. Co.	upholstry	1000 hides	1	"	200
Remis Industries, Inc.	sides (out of business)	NA	2	"	NA
Seton Company	sides	4000	2	"	410
Standard Finishing, Inc.	sides	250	2	"	50
H.E. and C.D. Williams, Inc	sides (out of business)	NA	2	"	30
			Subtotal Newark		890
			Subtotal N.J.		1980

PLANT (By Location)	PRODUCT LINE	OUTPUT	MAGNITUDE OF POLLUTION PROBLEM	TYPE OF TREATMENT FACILITY	EMPLOYMENT (1,000's)
NEW HAMPSHIRE					
Boscawen					
Allied Kid Co.					
Brezner Tanning Corp.	split shoe leather, bag, case and strap	2,250	3	PM	120
Bow					
Stablebrand Leather Co.	sides	10	2	I	2
Dover					
United Tanners, Inc.	sides	1400	2	M	110
Franklin (West)					
Louis Verza Leather, Inc.	split	380	3	NA	40
Lebanon					
E. Cummings Leather Co., Inc.	sides	1,500	2	M	100
Manchester					
Amoskeag Leather Finishing Co.	finishing	280	5	M	47
Remis (Parent Co.)					
Seal Tanning	sides	2,000	2	I	130

PLANT (By Location)	PRODUCT LINE	OUTPUT	MAGNITUDE OF POLLUTION PROBLEM	TYPE OF TREATMENT FACILITY	EMPLOYMENT (1968)
NEW HAMPSHIRE (Continued)					
Merrimack					
General Split Co. (Parent co.)					
Merrimack Leather Co.	sides	500	2	PM	40
Milton Mills					
Greene Tanning Corp.	sheepskin	150 doz/day	3	I	60
Nashua					
Amoskeag Leather (Parent co.)					
Granite States Leathers, Inc.	sides	400	2	I	60
Penacook					
Allied Kid (Parent co.)					
Brenner Tanning Co.	sides	1700	2	M	230
Pittsfield					
Suncook Tanning Corp.	splits	n.a.	3	PM	60
Tilton					
Tiltin Tanning Corp.	sheepskin	4800	3	P M	115
Winchester					
A.C. Lawrence Leather Co.	shearlings	3600	3	P M	170
			New Hampshire Subtotal		1303

PLANT (By Location)	PRODUCT LINE	OUTPUT	MAGNITUDE OF POLLUTION PROBLEM	TYPE OF TREATMENT FACILITY	EMPLOYMENT (est.)
NEW YORK					
Brooklyn					
Beinowitz & Son, Inc.	vegetable splits	1500 splits	1	M	30
Golden State Sheep Tanning Co.	shearlings	130 doz.	3	M	20
Gloversville-Johnston					
16 tanners	sheepskin/shearlings/ kid/sides	n.a.	2	M	1600 (indiv.plants: min=20,max=200
Gowanda					
Moench Tanning Co. Inc.	sides	1700 kid hides	2	I	300
Hagaman					
Hagaman Mfg Co.	1700 kid hides	2,400	2	PM	90
Middleville					
Martin-Deichsel Lea.Co.	specialties	5000	2 ..	n.a.	100
			sub-total, N.Y.=		2140
NORTH CAROLINA					
Goldsboro					
Drutan Products Inc.	sheepskin	300 doz.	3	n.a.	50

PLANT (By Location)	PRODUCT LINE	OUTPUT	MAGNITUDE OF POLLUTION PROBLEM	TYPE OF TREATMENT FACILITY	EMPLOYMENT (1,000)
NORTH CAROLINA (continued)					
Hazelwood					
A.C. Lawrence Leather Co.	sole	600	1	M	100

PLANT (By Location)	PRODUCT LINE	OUTPUT	MAGNITUDE OF POLLUTION PROBLEM	TYP. OF TREATMENT FACILITY	INVESTMENT ($1,000)
OHIO					
Ashtabula					
Raser Tanning Co.	vegetable-tanning	NA	1	NA	200
Conneaut					
Conneaut Leather, Inc.	vegetable-tanning	200 hides	1	NA	30
Sidney					
Sidney Tanning Co.	vegetable-tanning	260 hides	1	M	40
					270
OREGON					
Sherwood					
Frontier Leather Co., Inc.	side	1000 sides	2	M	39
PENNSYLVANIA					
Curwensville					
Howes Leather Co.	sole	1400/D	1	I	150
Coudersport					
Damascus Tanning Co.	sole	140	1	I	30

PLANT (By Location)	PRODUCT LINE	OUTPUT	MAGNITUDE OF POLLUTION PROBLEM	TYPE OF TREATMENT FACILITY	EMPLOYMENT (est.)
PENNSYLVANIA (Cont.)					
Elkland					
Proctor-Ellison (Parent Co.)					
Elkland Leather Co.	sole	2300	1	I	350
Fleetwood					
Garden State Tanning, Inc.	upholstery	1200	1	M	200
Girard					
Gunnison Bros. Inc.	bag, case & strap	30	1	I	75
Hanover					
W. D. Byron & Sons, Inc.	vegetable tanning (out of business)	NA	1	NA	NA
Mercersburg					
Loewengart & Co. Inc.	vegetable tanning	NA	1	N.A.	200
Philadelphia					
Will. Amer. Co.	kid and goatskins	(1080 Kid (1200 Kangar.	2	M	80
Reading					
Chestnut Operating Co.	upholstery	1400	1	M	200
Westfield					
Eberle Tanning Co.	sole lea.	1200	1	I	150

PLANT (By Location)	PRODUCT LINE	OUTPUT	MAGNITUDE OF POLLUTION PROBLEM	TYPE OF TREATMENT FACILITY	EMPLOYMENT (est.'80)
PENNSYLVANIA (Cont.)					
Williamsport					
Jos. H. Masser Leather Co.	vegetable tanning	NA	1	NA	NA
TENNESSEE					
Bolivar					
Akzona (Parent Co.)					
Armour Leather Co.	sides	2,000	2	I	280
Chattanooga					
Scholze Tannery, Inc.	vegetable tanning	500	1	PM	180
Milan					
Genesco	finishing	NA	5	NA	NA
Newport					
Swift and Co. (Parent Co.)					
A. C. Lawrence Leather Co.	sole	600	1	M	100

PLANT (By Location)	PRODUCT LINE	OUTPUT	MAGNITUDE OF POLLUTION POTENTIAL	TYPE OF TREATMENT FACILITY	EMPLOYMENT (No.)
TENNESSEE (Cont.)					
Shelbyville					
Mid-Tenn. Tanning Co	tan bellies	NA	3	NA	50
Tullahoma					
Lannon Mfg. Co.	sides, etc.	350	2	NA	60
Tenn. Tanning Co.	horse and cow hide	NA	3	NA	NA
Wartrace					
Coey Tanning Co.	bellies and splits	4800	3	NA	70
TEXAS					
Yoakum					
Texas Leather Co.	sides	64	2	NA	10
UTAH					
North Salt Lake					
Wells Tannery, Inc.	sheepskin	480	2	NA	11

PLANT (By Location)	PRODUCT LINE	OUTPUT	MAGNITUDE OF POLLUTION POTENTIAL	ACTIVE OR INACTIVE STATUS OF PLANT	WASTEWATER (1,000 gpd)
VERMONT					
N. Pownal					
John Flynn (Parent Co.)					
Pownal Tanning Co.	sides	NA	2	I	NA
VIRGINIA					
Luray					
Virginia Oak Tannery Inc.	sole	1250	1	I	250
Fearisburg					
Leas and McVitty Inc.	sole	600	1	"	100
Salem					
Leas and McVitty, Inc.	sole	600	1	"	100
			Virginia Subtotal		450
W. VIRGINIA					
Marlington					
Marlington Tannery	sole	600	1	NA	100
Frank Howes Leather	sole	1500		I	150

PLANT (By Location)	PRODUCT LINE	OUTPUT	PRIMARY SOURCE OF POLLUTION PROBLEM	STATE OF FACILITY	EMPLOYMENT (1970)
W. VIRGINIA (Cont.)					
Parsons					
Leas and McVitty					
Parsons Tan. Co.	sole	600	1	I	100
Petersburg					
Loewengart & Co. Inc.	sole	NA	1	I	NA

PLANT (By Location)	PRODUCT LINE	OUTPUT	MAGNITUDE OF POLLUTION PROBLEM	TYPE OF TREATMENT FACILITY	EMPLOYMENT (...)
WISCONSIN					
Berlin					
Berlin Tanning & Mfg. Co.	sides, garment, shoe leather	1,200	2	PM	70
Cudahy					
Cudahy Tanning Co.	deerskins, sides for shoe & sporting goods	1,000 deer skins	2	M	90
Fond du Lac					
Fred Rueping Leather Co.	extremes & side upper leather for shoes, splits in the blue	7,000 pieces	2	M	360
Hartford					
M.B. Place & Co.	deer, shearlings, cowsides	200	2	NA	70
Milwaukee					
Badger State Tanning Co.	work glove splits, industrial garment splits, selected blue splits	8,500 PC	3	M	50
Blackhawk Tanning Corp.	finished & suede splits & pig	140	3	M	180
Flagg Tanning Corp.	insole & outside splits	550	4	M	100
A.F. Gallun & Sons Corp.	calf tanned for shoes	--	2	M	250
A.L. Gebhardt Co.	various (side)	400	2	M	65

PLANT (By Location)	PRODUCT LINE	OUTPUT	MAGNITUDE OF POLLUTION PROBLEM	TYPE OF TREATMENT FACILITY	EMPLOYMENT (000)
WISCONSIN (continued)					
Milwaukee (continued)					
General Split Corp.	splits for shoe, bag, garment, glove	10,000	3	M	
Great Lakes Tanning Co.	shearlings	--	3	M	90
Beatrice Foods (parent co.) Pfister & Vogel Tanning Co., Inc.	sides for shoes	--	2	M	500
Seidel Tanning Corp.	sides for shoes, footwear	1,200-1,500	2	M	115
Thiele Tanning Co.	garment, glove, mocassin leather splits	--	2	M	115
Western Leather Products Corp.	splits & sole leather	--	3	M	?
Spencer Packing Co. (parent) Wisconsin Leather Co.	sides for shoes, boots, mechanical leathers	--	2	M	200
Oshkosh					
Oshkosh Tanning Co.	tanners & dyers of shearlings	500	3	M	28
Sheboygan					
Armour Leather Co.	kips, sides, splits, shoe leather	--	2	M	500

PLANT (By Location)	PRODUCT LINE	OUTPUT	MAGNITUDE OF POLLUTION PROBLEM	TYPE OF TREATMENT FACILITY	INDUSTRY (Code)
WISCONSIN (continued)					
So. Milwaukee					
Rapco Leather	sole leather for shoes	1,000	2	M	100
Midwest Tanning Co.	cow, horse, buckskins, side splits	600	2	M	100
			Wisconsin sub-total		3470

TABLE

SAMPLE OF TANNERIES WITH SIGNIFICANT LOCAL EMPLOYMENT WHICH MUST BUILD OWN TREATMENT PLANTS.

TENNESSEE	
Bolivar Akzona (Armour Leather Company)	280
VERMONT	
N. Pownal Pownal Tanning Company	NA
WEST VIRGINIA	
Parsons Parsons Tanning Company	100
Petersburg Lowengart and Company, Inc.	NA
MAINE	
East Wilton Wilton Tanning Company	190
Howland (Pine Tree Division) Irving Tanning Company	200
GEORGIA	
Buford Bona Allen, Inc. (Tandy Corp.)	260
MARYLAND	
Williamsport W.J. Byron & Sons, Inc.	190
OREGON	
Sherwood Frontier Leather Company, Inc.	39

PENNSYLVANIA	
Curwensville Howes Leather Company	190
Coudersport Damascus Tanning Company	30
Elkland Elkland Leather Company (Proctor-Ellison)	350
Mercersberg Lowengart & Company, Inc.	200
NEW HAMPSHIRE	
Manchester Milton Mills (Greene Tanning Corporation)	65